5. ENVIRONMENTAL IMPACTS

5.1 Introduction

This chapter analyzes the potential impacts to human and environmental resources resulting from construction and operation of the proposed Kentucky Pioneer Integrated Gasification Combined Cycle (IGCC) Demonstration Project at the J.K. Smith Site in Trapp, Kentucky. Analyses of the potential impacts resulting from the two No Action Alternatives are also provided.

5.2 Land Use

This section discusses the potential effects of the construction and operation of the Kentucky Pioneer IGCC Demonstration Project facility on land use at the project site and surrounding areas.

5.2.1 Methodology

The land use resources analysis considers a region of influence (ROI) that includes the 121-hectare (300-acre) project site, as well as the rest of the J.K. Smith Site and surrounding areas. The land use resources analysis also considers an ROI that assumes a proposed route for a 138-kilovolt (kV) transmission line that extends northeasterly from the project site to the Spencer Road Terminal in Montgomery County, Kentucky. Potential impacts to land use resources were qualitatively assessed by comparing potential land use changes to the existing land use patterns, plans, and policies.

5.2.2 Land Use Impacts from No Action Alternative 1

Under No Action Alternative 1, the U.S. Department of Energy (DOE) would not provide partial funding for the design, construction, and operation of the proposed project. Because no new construction would occur, there would be no impacts to land use resources.

5.2.3 Land Use Impacts from No Action Alternative 2

Under No Action Alternative 2, the natural gas-fired combined-cycle units process area would occupy approximately 4.8 hectares (12 acres) of the 121-hectare (300-acre) project site leased to Kentucky Pioneer Energy, LLC (KPE), from the East Kentucky Power Cooperative (EKPC). The project would affect approximately 5 to 8 hectares (12 to 20 acres), all of which is located within the 121-hectare (300-acre) site. The process area has been previously disturbed by EKPC during the initial site preparation for the abandoned construction of the J.K. Smith Power Station in the early 1980s. Preliminary grading and some foundations were completed in the area. The site was originally prepared for a power station that was never completed due to a decrease in the demand for electricity at that time. No effects on surrounding land uses are expected to occur from the construction and operation of the natural gas-fired combined-cycle units. The Winchester-Clark County Planning Commission does not consider utility structures when determining zoning for an area. Therefore, the project area will remain zoned agricultural.

The proposed 138-kV transmission line would be approximately 27 kilometers (17 miles) in length; however, the exact route for the line has yet to be determined. The proposed route for the line extends northeasterly from the project site to the Spencer Road Terminal in Montgomery County, Kentucky, where it will interconnect with the existing local power grid. For this environmental impact statement (EIS), the transmission line is assumed to be constructed in a similar fashion to other 138-kV electric transmission lines built by EKPC in the project area. The line would require a 30 to 45 meter (100 to 150 foot) wide right-of-way. It is assumed that the majority of the transmission line route would extend through agricultural/rural portions of Clark and Montgomery Counties and not through highly populated residential areas. The transmission line is not expected to effect land use on surrounding areas or local land use plans or policies during construction or operation. As stated above, the Winchester-Clark County Planning Commission does not consider utility structures when determining zoning for an area. Therefore, the zoning for the area crossed by the proposed transmission line will remain the same.

5.2.4 Land Use Impacts from the Proposed Action

All land use impacts from No Action Alternative 2 would also occur under the Proposed Action. The gasification island would be constructed within the 4.8-hectare (12-acre) process area described in Section 5.2.3. In addition, supporting facilities would be built within the 121-hectare (300-acre) site, including a rail car unloading facility, a covered coal and refuse derived fuel (RDF) pellet storage facility, and a wastewater basin and would use a maximum of an additional 2.8 hectares (7 acres). This area has been

previously disturbed, therefore, impacts to land use would be minor. No effects on surrounding land uses are expected to occur from the construction and operation of the gasification island. It has not yet been determined by the Winchester-Clark County Planning Commission whether or not zoning would change within the J.K. Smith Site after the gasification island and supporting facilities are built.

5.3 Socioeconomics

Any sudden influx of capital or employment, such as a large construction project, to a region will impact the existing socioeconomic environment to some degree. Socioeconomic factors, such as employment, income, population, housing, and community services, are interrelated in their response to the implementation of an action. This section describes the potential effects of the Kentucky Pioneer IGCC Demonstration Project on the existing socioeconomic environment of the ROI of Clark, Fayette, and Madison Counties.

5.3.1 Methodology

Socioeconomic impacts are addressed in terms of both direct and indirect impacts. Direct impacts are those changes that can be directly attributed to the Proposed Action, such as changes in employment and expenditures from the construction and operation of the proposed plant. Indirect impacts to the ROI occur based on the direct impacts from the Proposed Action. Two factors indirectly lead to changes in employment levels and income in other sectors throughout the ROI: (1) the changes in site purchase and non-payroll expenditures from the construction and operation phases of the plant, and (2) the changes in payroll spending by new employees. The total economic impact is the sum of the direct and indirect impacts.

The direct impacts estimated in the socioeconomic analysis are based on project summary data developed by DOE in conjunction with KPE's contractors and representatives. Total employment and earnings impacts were estimated using Regional Input-Output Modeling System multipliers developed specifically for the Kentucky Pioneer IGCC Demonstration Project ROI by the U.S. Bureau of Economic Analysis (BEA). These multipliers are developed from national input-output tables maintained by the BEA and adjusted to reflect regional trading patterns and industrial structure. The tables show the distribution of the inputs purchased and the outputs sold for each industry for every county in the United States. The multipliers for this analysis were developed from the input-output tables for the three counties comprising the ROI. The multipliers are applied to data on initial changes in employment levels and earnings associated with the proposed project to estimate the total (direct and indirect) impact of the project on regional earnings and employment levels. For this analysis, the term direct jobs refers to the employment created by the project, and direct income refers to project workers' salaries. The term indirect jobs refers to the jobs created in other employment sectors as an indirect result of new employment at the construction site, and indirect income refers to the income generated by the new indirect jobs.

The importance of the actions and their impacts is determined relative to the context of the affected environment, or project baseline, established in Section 4.3. The baseline conditions provide the framework for analyzing the importance of potential economic impacts that could result from the project. Impacts would be determined to be significant if the change resulting from the action analyzed would exceed historical fluctuations in the regional economy.

KPE provided estimates of construction and operation workforces and durations. The overall construction workforce would average 600 workers and reach a peak force of 1,000 for short periods of time. The socioeconomic impacts on employment and income are evaluated during the two phases of the project, construction and operation. The construction phase is analyzed for two different levels, average worker level and peak worker level, due to the large difference between the two figures. The employment generated by the operation of the plant is expected to remain constant at 120 employees for the duration of its in-service period of 20 years. The power island is estimated to cost 20 percent, or $82.8 million, of the overall $414 million project cost. Under No Action Alternative 2, only the power island would be constructed. Therefore, it has been assumed that 20 percent of all estimates provided for the Proposed Action would be required to construct and operate No Action Alternative 2.

Appraisal methods used to estimate land values are based on objective characteristics of the property and any improvements. The impact that the presence of a nearby aboveground facility may have on the value

of the land depends on many factors including size, existence of other facilities, the current value of the land, its location, current land use, and emotional response. A potential purchaser of a property would make a decision to purchase based on the planned use (such as agricultural, future subdivision, or home) of the property in question. For this analysis, impacts to property values are estimated based on the factors that may affect a potential purchaser of the land.

5.3.2 Socioeconomic Impacts from No Action Alternative 1

Under No Action Alternative 1, the proposed facility would not be built. No new employment or spending in the area would result and no direct or indirect affects would be attributable to the project. Therefore, employment and population in the ROI would remain the same as the baseline presented in Section 4.3 of this EIS and no socioeconomic impacts would be experienced.

5.3.3 Socioeconomic Impacts from No Action Alternative 2

5.3.3.1 Construction Phase

Under No Action Alternative 2, the two natural gas-fired General Electric (GE) 7FA combined cycle turbine units, the 27-kilometer (17-mile), 138-kV J.K. Smith to Spencer Road transmission line, and all associated support structures are assumed to be constructed at the site, which is located approximately 3.2 kilometers (2 miles) west of Trapp, Kentucky. Since the overall duration of the project construction is 30 months and only 20 percent of the resources are assumed to be devoted to the construction of the power island, the facility would take 6 months to build. The facility would employ 120 workers during the average construction period and 200 workers during peak periods. For the 6-month construction period, indirect employment would increase by 138 jobs during the average period and 230 jobs during peak periods. Though the ROI is comprised of Clark, Fayette, and Madison Counties, all facility construction and operation employment occurs in Clark County. The indirect employment created as a result is spread throughout the ROI. The average annual heavy construction salary, which includes industrial facility construction, for Clark County was $37,800 in 1998 (CBP 2000). Construction of the No Action Alternative 2 would result in between $2.3 and $3.8 million in direct new income and $2.2 and $3.5 million in indirect new income to the ROI for the 6-month construction period. The exact figures would depend on the duration of peak construction employment at the site. The comparatively minor number of construction jobs and indirect jobs would not present any significant socioeconomic impacts and unemployment, housing, and community service effects would not be expected.

5.3.3.2 Operations Phase

The power island facility would employ 20 percent, or 24 of the estimated 120 total operations phase employees required for the overall project. The 24 jobs directly generated by the operation of the facility would indirectly result in the creation of 54 other jobs in the ROI. These 78 jobs would be filled from the existing labor pool of the ROI. This should not result in any significant impacts as the number of direct and indirect jobs resulting from the operation of the facility is relatively small compared to the overall labor pool of the ROI. The unemployment rate would be slightly lower than the current 2.1 percent as a result, but the overall change in employment is insignificant and the statistic would remain at the 2.1 percent level. The average salary for utility employees in Clark County was $46,900 in 1998 (CBP 2000). This results in approximately $1.13 million in new direct income and $1.24 million in new indirect income annually for the established 20-year operational timeframe of the facility. The small number of jobs created by the operation of the facility is expected to have no impact on housing in the ROI as there is adequate housing available to accommodate any new residents. Community services in the ROI, including schools, hospitals, and fire services, should not experience any significant impacts from any population influxes as the jobs are expected to be filled from the existing labor pool. Should individuals move into the ROI for employment resulting from this project, existing community services should adequately meet the needs of the minor population influx.

As discussed in Section 5.5, Aesthetic and Scenic Resources, the facility would not be visible outside of the boundaries of the 1,263-hectare (3,120-acre) J.K. Smith Site. The presence of the facility may influence a potential purchaser of property located near the facility. The proposed facility would be located approximately 1.6 kilometers (1.0 mile) from the nearest tract available to a potential buyer, which is the nearest residence. The distance of the facility from nearby tracts of land should mitigate any potential effects on buyers and each potential purchaser has a different goal and ability to purchase land. Therefore, any impacts to property values would be negligible under No Action Alternative 2.

5.3.4 Socioeconomic Impacts from the Proposed Action

5.3.4.1 Construction Phase

Under the Proposed Action, the gasification technology facilities, two combined cycle units, fuel storage area, rail car loading and unloading areas, and all required associated support equipment would be constructed at the existing 540 megawatt (MW) natural gas-fired plant. The Proposed Action would cost $414 million and would take 30 months to construct. The project would employ an average construction work force of 600 people which could expand to 1,000 during periods of peak construction activity. The creation of 600 new jobs in Clark County and the associated new income would indirectly create 690 new jobs throughout the ROI for the 30-month construction period. The expansion of the construction work force to 1,000 employees during periods of peak construction would add an additional 460 jobs to the ROI. The Proposed Action would result in approximately $56.7 million in direct new income and $53.2 million in indirect new income for the 30-month construction period. These figures would increase depending upon the duration of peak construction activity. Each month that the construction phase would require peak work forces, an additional $1.3 million in direct income and $1.2 million in indirect income would be generated.

As stated previously, the unemployment rate for the ROI is 2.1 percent, which is relatively low. Most economists feel that a healthy unemployment rate is closer to 4 or 5 percent. The low unemployment rate places a strain on companies seeking to hire employees for a permanent or temporary basis, as workers are not available to take new positions. However, the unemployment rate should not be an issue with regards to the construction of the facility. Construction, by its very nature, employs workers on a temporary basis, therefore, once the structure is completed, the worker must find a new job. According to the County Business Patterns for the ROI, 10,828 people were employed in the construction industry within the ROI in 1998. Of these, 1,677 were employed in the category of heavy construction, which includes industrial and utility facility construction (CBP 2000). This establishes a labor pool within the ROI adequate to employ the 600 workers required during average construction periods.

Expansion to peak construction levels may put a strain on the local construction labor pool as it is somewhat optimistic to assume that nearly half of all construction workers in the ROI would be employed on the same project. Therefore, peak periods of construction may require an influx of labor into the ROI for brief periods of time. As established in Section 4.3, Socioeconomics, the housing characteristics of the ROI indicate that existing housing capacity should adequately accommodate a temporary influx of workers and no significant impacts would be felt. Workers entering the ROI on a temporary basis would most likely seek residence in a rental unit. The ROI has a 9.5 percent vacancy rate, or over 5,000 vacant units available for occupancy. Existing community services, including schools, hospitals, and fire and police services, would not be significantly affected since most of the construction workers would come from within the ROI and any influx would be of short duration.

The indirect employment created by the project would put more of a strain on local resources, as these jobs would be more difficult to fill from the existing labor pool of the ROI. During periods of average construction activity, 690 jobs would be indirectly created. This number would increase to 1,150 during peak periods of construction. Peak periods would be temporary by nature and, therefore, the larger number of indirect jobs created by peak work forces would also be on a temporary basis. The large majority of the indirect jobs created would be in the retail and services industries.

According to the unemployment figures presented in Section 4.3, Socioeconomics, a total of 4,229 individuals were unemployed in the ROI in 2000. This figure represents active job seekers in the labor pool who are not currently employed. This figure, however, does not capture the potential labor supply, which are individuals not currently seeking employment who would work should jobs become available. The Winchester Labor Market Area Statistics estimate that over 3,700 individuals fall into this category in the ROI. Another factor that would assist in mitigating the socioeconomic impacts of the creation of 2,150 total (1,000 direct and 1,150 indirect) jobs during periods of peak construction at the site is the future labor supply. This figure represents individuals who will become 18 years of age between 2001 and 2005. Assuming a constant rate over the 5-year period, 4,000 new individuals will be added to the labor supply each year in the ROI (WIA 1999).

The addition of new individuals to the labor supply in coming years and the large number of individuals in the potential labor supply category will help fill the jobs created both directly and indirectly by the construction of the facility. All individuals already living within the ROI who gain employment from this project will not impact the existing community services and housing levels as they are already included in the descriptions established in Section 4.3, Socioeconomics. It is likely, however, that individuals would come from outside the ROI to fill some of the newly created jobs. Any influx is expected to be relatively small in size and should have little to no impact on existing community services. Minor impacts may include an increase in classroom sizes in area schools and the need for additional police or fire service employees. Additional tax revenue generated by the project would be enough to employ additional staff at the Clark County Sheriff's Office. All of the fire services in the ROI utilize volunteer companies. Additional volunteers would be adequate to handle any additional strain on fire resources. As stated in Section 4.3, Socioeconomics, a new Clark County Fire Station is scheduled to be built near the J.K. Smith Site in the near future. Existing housing vacancy rates indicate that there is enough housing available in the ROI to accommodate any workers who move into the area.

The project location, 3.2 kilometers (2 miles) west of Trapp, Kentucky, is somewhat isolated. The population of Trapp is very small with approximately 100 people (Clark 2001). At periods of peak construction, ten times as many people would be employed onsite than live in the closest community. The size and location of the project site would not be sufficient to meet the needs (i.e., food) of the large number of people employed during the construction phase. Winchester, with a population of 15,800 (Clark 2001), is the closest town to the project site of sufficient size to supply the needs of workers at the site. A combination of the following two significant impacts would occur: (1) increased traffic on local roads to and from Winchester; and (2) an influx of businesses to the community of Trapp. This combination of impacts applies to the operations phase analyses of the Proposed Action and No Action Alternative 2 as well. The first impact is addressed in Section 5.11, Traffic and Transportation. An increase in businesses in Trapp would benefit the community by bringing extra income to the area. Employment generated by these businesses is a specific example of indirect jobs associated with the project and the effects of the new employment are included in the indirect impact analysis. The extent of the impact is directly related to the amount of employment at the project site. During periods of peak construction, there would be greater demand for services at the project site, and thus, more businesses would operate in Trapp and more jobs would be created in the restaurants. During the operations phase of the project, less people would be employed onsite and, thus, there would be less demand for food services near the site.

5.3.4.2 Operations Phase

The completed facility is scheduled to be in service for 20 years. The Proposed Action would employ 120 workers onsite in Clark County. This would result in the indirect creation of 270 jobs in the ROI. The creation of 120 jobs at the facility would create approximately $5.6 million and $6.2 million in direct and indirect new income annually, respectively. All direct and indirect jobs created by the operation of the facility would be filled from the labor pool in the ROI since all jobs associated with the construction phase of the project would cease to exist once construction has been completed and those previously employed individuals would be able to fill new jobs. All individuals who moved into the ROI to fill

employment opportunities during the construction phase would most likely move out of the ROI once construction has ended, leaving community services and housing at similar levels prior to their arrival. These are adequate to meet the needs of all individuals employed directly or indirectly by the operation of the facility. Construction workers would likely find employment on other construction projects. Unemployment would likely rise slightly in the ROI with the shrinking of job opportunities during the operations phase. This is not a serious concern, however, since it would not cause a rise above 4 percent, which is an acceptable level in a healthy economy.

As discussed in Section 5.5, Aesthetic and Scenic Resources, the facility would not be visible outside of the boundaries of the 1,263-hectare (3,120-acre) J.K. Smith Site. Since the presence of an aboveground facility disrupts the visual aesthetics, a potential purchaser may decide not to purchase the property. However, each potential purchaser has a different goal and ability to purchase land. The presence of the facility may influence a potential purchaser of property located near the facility. The proposed facility would be located approximately 1.6 kilometers (1.0 miles) from the nearest tract available to a potential buyer, which is the nearest residence. The distance of the facility from nearby tracts of land should mitigate effects on potential buyers. Under the Proposed Action, the disruption to the viewshed caused by the gasifier stacks may result in negative impacts to property values for areas near the facility; however, there is no established method for determining the exact quantitative impacts to property values from an action because the value is based on numerous factors.

5.4 Cultural Resources

This section discusses the potential impacts of the Kentucky Pioneer IGCC Demonstration Project on cultural resources, archaeological and historic sites, and areas of cultural or religious importance to communities or ethnic groups on or surrounding the proposed project site.

5.4.1 Methodology

Potential impacts to cultural resources, in general, are assessed by applying the criteria of adverse effect as defined in 36 *Code of Federal Regulations* (CFR) 800.5[a]. An adverse effect is found when an action may alter the characteristics of a historic property that qualifies it for inclusion on the National Register of Historic Places (NRHP) in a manner that would diminish the integrity of the property's location, design, setting, workmanship, feeling, or association. Some examples of adverse effects to cultural resources include: physical destruction or damage; alterations not consistent with the *Secretary of the Interior's Standards for Rehabilitation and Guidelines for Rehabilitating Historic Buildings*; relocation of a property; isolation and restriction of access; introduction of visible, audible, or atmospheric elements out of character with the resource; neglect resulting in deterioration; or transfer, lease or sale of historic properties without adequate protections. Adverse effects may include reasonably foreseeable effects caused by the action that may occur later in time, be further removed in distance, or be cumulative. Activities conducted under the alternatives are measured against the criteria of adverse effect to determine the potential for and intensity of impacts to cultural resources. The assessment of impacts to traditional cultural properties and practices also requires a focused consultation effort with the affected community.

While the lead federal agency makes the determination of adverse effect, consultation with the State Historic Preservation Officer (SHPO), in this case the Kentucky Heritage Council (KHC) and other parties, is required regarding the application of the criteria of adverse effect and in developing mitigation efforts to avoid or reduce any impacts. Consultation with the KHC has occurred for this undertaking through a letter requesting participation and assistance in completion of the Section 106 Review process as described in Section 4.4, Cultural Resources. The assistance of the KHC was also requested to identify individuals, organizations, local governments or Native American groups who may wish to be consulting parties on this undertaking and to identify potential information sources. The Kentucky SHPO determined that the Section 106 Review process was completed for this project's Area of Potential Effect in December of 1980. The terms of the Memorandum of Agreement drawn up in conjunction with the Advisory Council on Historic Preservation for the J. K. Smith Power Station have been met under the Kentucky Pioneer IGCC Demonstration Project and further identification, evaluation, mitigation, and consultation activities are no longer required.

5.4.2 Cultural Resource Impacts from No Action Alternative 1

No impacts to cultural resources would be expected under No Action Alternative 1.

5.4.3 Cultural Resource Impacts from No Action Alternative 2

As described in Section 4.4, the cultural resources of the 121-hectare (300-acre) project area were identified, evaluated for NRHP-eligibility, and data recovery mitigation measures were implemented in conjunction with the J.K. Smith Power Station undertaking. The Section 106 Review process was completed according to the standards and guidelines in place at that time. Subsequent grading and other site development activities for the aborted J.K. Smith project have decreased the potential for the existence or discovery of intact prehistoric or historic resources that would meet NRHP-eligibility requirements. Likewise, previous site disturbances have decreased the likelihood of any intact Native American or other traditional use areas or religious sites, although notification and exploration of this issue with potential consulting parties has not been completed. In accordance with 36 CFR 800.4(d) of the Advisory Council on

Historic Preservation's revised regulations, the Kentucky SHPO has determined that there is no effect on historic properties.

The precise location of utility and transmission line corridors, and any additional disturbance areas such as borrow pits and construction laydown areas have not been defined. As part of the Section 106 Review process for the transmission line, potential impacts to historic properties in these areas must be addressed. Determination of the potential for visible, audible and atmospheric alterations to the setting of off-site cultural resources would be required in consultation with the KHC. If resources are encountered during construction, discovery procedures discussed in Section 5.18.1, Cultural Resources, would be implemented.

5.4.4 Cultural Resource Impacts from the Proposed Action

The Proposed Action is a federal undertaking subject to the Section 106 regulations found at 36 CFR 800. It involves an activity "requiring a federal permit, license or approval" which may have an effect on historic properties (36CFR 800.16[y]).

As described in Section 4.4, the cultural resources of the 121-hectare (300-acre) project area were identified, evaluated for NRHP-eligibility, and data recovery mitigation measures were implemented in conjunction with the J.K. Smith Power Station undertaking. The additional 2.8-hectare (7-acre) area required under the Proposed Action for the construction of the rail car loading and unloading and storage facilities is also located within the 121-hectare (300-acre) project area. The Section 106 Review process was completed according to the standards and guidelines in place at that time. Subsequent grading and other site development activities for the aborted J.K. Smith project have decreased the potential for the existence or discovery of intact prehistoric or historic resources that would meet NRHP-eligibility requirements. Likewise, previous site disturbances have decreased the likelihood of any intact Native American or other traditional use areas or religious sites, although notification and exploration of this issue with potential consulting parties has not been completed. In accordance with 36 CFR 800.4(d) of the Advisory Council on Historic Preservation's revised regulations, the Kentucky SHPO has determined that there is no effect on historic properties.

As part of the Section 106 Review process for the transmission line, potential impacts to historic properties in these areas must be addressed. Determination of the potential for visible, audible and atmospheric alterations to the setting of off-site cultural resources would be required in consultation with the KHC. If resources are encountered during construction, discovery procedures discussed in Section 5.18.1 would be implemented.

5.5 Aesthetic and Scenic Resources

This section discusses the potential effects of the construction and operation of the Kentucky Pioneer IGCC Demonstration Project facility on aesthetic and scenic resources at the project site and surrounding areas.

5.5.1 Methodology

Potential impacts to aesthetic and scenic resources include the construction of new structures and/or modifications to existing structures and the potential contribution of air pollutants that may alter the view or quality of these resources. The impact analyses for the Proposed Action considered the effects of construction and operation of the Kentucky Pioneer IGCC Demonstration Project on those lands in which the plant is visible. The impact analyses also consider an ROI that assumes a proposed route for a 138-kV transmission line that extends northeasterly from the project site to the Spencer Road Terminal in Montgomery County, Kentucky.

5.5.2 Aesthetic and Scenic Resource Impacts from No Action Alternative 1

Under No Action Alternative 1, DOE would not provide partial funding for the design, construction, and operation of the proposed project. Because no new construction would occur, there would be no impacts to aesthetic or scenic resources.

5.5.3 Aesthetic and Scenic Resource Impacts from No Action Alternative 2

The proposed combined cycle units would not have any significant impacts on aesthetic and scenic resources. Since the combined cycle units would be built within the J.K. Smith Site, the units would not be visible from outside the site area. The units would most likely not be visible from the high observation position of the top of Pilot Knob State Nature Preserve located 12.8 kilometers (8 miles) east of the project site. The facility will have lighting as required for safety purposes to illuminate stairways and entrances. Lighting will be needed for downward illumination, thus impacts from night lighting should be minimal. In addition, there would be no visible plumes associated with the combined cycle units. The proposed natural gas-fired combined-cycle units also would not have any significant impacts on the aesthetic and scenic resources of the Daniel Boone National Forest or the Red River.

Construction of the combined cycle units would produce dust that may affect visibility temporarily in the local construction areas within the J.K. Smith Site. Dust control measures would be implemented to minimize impacts.

The proposed new transmission line would be approximately 27 kilometers (17 miles) in length; however, the exact route for the line has yet to be determined. For this EIS, the transmission line is assumed to be constructed in a similar fashion to other 138-kV electric transmission lines built by EKPC in the project area. The line would require a 30 to 45 meter (100 to 150 foot) wide right-of-way. The electrical conductors would be supported by double wood and/or steel, single and/or double pole structures. The average height of the support structures would be approximately 24 meters (80 feet) aboveground and the average span between structures would be 122 to 305 meters (400 to 1,000 feet), depending upon the terrain. It is assumed that the majority of the transmission line route would extend through agricultural/rural portions of Clark and Montgomery Counties and not through highly populated or residential areas. The most significant impacts to the general public and residences in the area, if any, would be disturbance during construction, such as increased noise and dust. In addition, the proposed transmission line would introduce new elements which would alter the existing landscape. Long-term impacts to the visual quality of the landscape would be the introduction of pole structures. The impacts from the introduction of the pole structures could be significant when viewed from sensitive viewpoints. It is assumed that the transmission line would not be visible to the public except in areas where the proposed route crosses roads or highway systems.

5.5.4 Aesthetic and Scenic Resource Impacts from the Proposed Action

Aesthetic and scenic resource impacts from the construction of the power island and transmission line would be the same as those detailed in the No Action Alternative 2 analysis.

The proposed new facility stacks associated with the gasification island would be approximately 65 meters (213 feet) tall. The upper portions of the stacks would likely be visible from the city of Winchester located 13.4 kilometers (8.3 miles) from the site. In addition, the facility structures would be visible from the 222.5-meter (730-foot) high observation position on top of Pilot Knob State Nature Preserve located 12.8 kilometers (8 miles) east of the project site. The facility would also be visible from the community of Trapp located approximately 3.2 kilometers (2 miles) east of the project site. The facility stacks will have a strobe light to meet the Federal Aviation Administration lighting requirements. The facility will also have lighting as required for safety purposes to illuminate stairways and entrances. Lighting will be hooded for downward illumination, thus impacts from night lighting should be minimal. In addition, the proposed gasification island would not have any significant impacts on the aesthetic and scenic resources at the Daniel Boone National Forest or at the Red River.

There would be visible plumes associated with the cooling towers. The visibility of the plumes would be dependent upon the weather and wind patterns, and the location of the viewer within the general topography of the area. The plumes would most likely be visible from the community of Trapp, the Pilot Knob State Nature Preserve, and up to 12.8 kilometers (8 miles) from the J.K. Smith Site.

In the event of an uncontrollable pressure buildup within the gasification system, the synthesis gas (syngas) would be routed to an emergency flare. The emergency flare would release the pressure on the system by burning the excess syngas. Facility design has yet to be completed and the location of the emergency flare vent has not been indicated. For this analysis, the worst-case scenario would be to locate the flare vent at or near the top of the 65 meter (213 feet) tall gasification facility stacks. During an emergency flare release, the flare would be visible from the same distances as the facility stacks, as described earlier in this section. The emergency flare would be an infrequent event of short duration and, as such, would not have a lasting effect on the aesthetics and scenic resources of the project site area. It is possible for emergency flares to occur at night, resulting in brief periods of additional lighting near the facility. The short duration of these events, however, should not have any significant impact to local residents other than brief periods of minor illumination.

Construction of the gasification island would produce dust that may affect visibility temporarily in the local construction areas. Dust control measures would be implemented to minimize impacts.

5.6 Geology

This section discusses the potential effects of the construction and operation of the Kentucky Pioneer IGCC Demonstration Project facility on geology at the project site and surrounding areas.

5.6.1 Methodology

The geology and soils analysis considers a region of influence which includes the Kentucky Pioneer IGCC Demonstration Facility project area, as well as the entire J.K. Smith Site. Impacts to these resource areas were determined by assessing potential changes in existing geology and soils that could result from construction activities and operations under the Proposed Action. In addition, potential impacts from geologic hazards are evaluated.

5.6.2 Geology Impacts from No Action Alternative 1

Under No Action Alternative 1, DOE would not provide partial funding for the design, construction, and operation of the proposed project, and the project would not be built. Because no new construction would occur, there would be no impacts to geologic or soils resources from project activities. However, because the site has already been disturbed, any erosion that may be occurring would continue.

5.6.3 Geology Impacts from No Action Alternative 2

Because the site was previously disturbed during site preparation by EKPC in the 1980s, the construction of the Kentucky Pioneer IGCC Demonstration Project would have limited impact on geological resources. Most prime farmland soils have already been disturbed and there are no mineral resources on the project site.

Hazards posed by geological conditions are expected to be minor. Based on the available data, it is unlikely that karst terrain is present at the project site. Several factors support this theory:

- The site-specific boring logs do not indicate karst development.
- The geologic formations found beneath the project site are generally described as not having karst features.
- The project site is not in a “highly developed” or “intense karst” area.
- There are non-karst areas in the vicinity of the project site.

The major part of east-central Kentucky, including the project site, is in a region of limited earthquake activity. Very strong earthquakes that have occurred in the New Madrid seismic zone, located approximately 482 kilometers (300 miles) west-southwest of the project site, have caused minor damage in east-central Kentucky. Furthermore, no known capable faults, as defined under 10 CFR 100, exist in the project vicinity. The faults closest to the project site have had no movement in historic time. Ground rupture as a result of an earthquake is unlikely. It is thus unlikely that the site would be affected by seismic activity.

Soil disturbance caused by building material laydown would be minimal because the soil has been previously graded. Properties and conditions of soils underlying the proposed site have no construction limitations. Soil disturbance from new construction would occur at construction laydown areas, destroying soil profile, and leading to a possible temporary increase in erosion as a result of stormwater runoff and wind action. Standard erosion control methods would limit soil loss and transport of eroded soil.

The soil types at the proposed site are considered prime farmland soils; however, the disturbed portions of the site are no longer considered prime farmland. Thus, new construction associated with implementing No Action Alternative 2 would cause a slight increase in loss of prime farmland.

There is potential for soil contamination from fuel or other hazardous material spills, primarily during construction, but also during operation. The shallow depth to bedrock (approximately 1.5 meters [5 feet]), however, would limit the potential for contaminant migration.

5.6.4 Geology Impacts from the Proposed Action

Geologic impacts for the Proposed Action would be the same as those detailed in the No Action Alternative 2 analysis. Additional construction including foundation laying would be required for the storage facilities and railcar loading and unloading sites. The design of these facilities will not be completed until project funding is finalized. The construction of these facilities would result in additional disturbances to small areas of prime farmland soils, though the exact acreage disturbed cannot be given until the design of the facility is completed. The impacts to geologic resources from the Proposed Action would be slightly greater than those described above for No Action Alternative 2, though the exact difference is dependant upon the size of the associated facility structures required to support the operation of the gasification island. Other potential soil contaminant sources during operation are coal and other feed material storage piles, if stored on bare ground and left exposed to rainfall. The facility will be designed to store and convey such material in totally enclosed structures, thus eliminating the potential for migration to soil or groundwater. The potential impacts to the project from geologic hazards would be the same under the Proposed Action as under No Action Alternative 2.

5.7 Air Resources

The air resources in the region of the Kentucky Pioneer IGCC Demonstration Project could be affected by air pollutant emissions associated with construction and operation activities. This section describes the assessment methodology and potential effects of construction and operation of the proposed project on local and regional air quality.

5.7.1 Methodology

Air quality impacts have been evaluated in terms of anticipated emissions from proposed facilities and resulting changes to ambient air quality in the project vicinity. Data used for the impact assessment come primarily from the environmental information volume (EIV) (EIV 2000), and were based in turn on the Prevention of Significant Deterioration (PSD) Permit Application for the proposed facility. The PSD/Title V Permit Application and the Final PSD/Title V Permit for the facility have been used as additional sources of information.

The PSD/Title V Permit Application (Radian 1999) contained emission estimates for various components of the facility plus a dispersion modeling analysis that identified maximum incremental ambient air quality impacts. Dispersion modeling analyses followed normal procedures: preparation of a modeling protocol agreed to by regulatory agencies; modeling analyses using the Industrial Source Complex model; and use of 5 years of representative meteorological data to identify maximum ambient air quality impacts. Impact significance has been evaluated by comparing modeled ambient air quality increments to thresholds in applicable PSD regulations and National Ambient Air Quality Standards (NAAQS).

The Final PSD/Title V Permit for the Kentucky Pioneer IGCC Demonstration Project facility (permit number V-00-049) has been issued pursuant to state regulations (401 Kentucky Administrative Regulations [KAR] Parts 50, 51, 59, 60, and 63) that incorporate federal *Clean Air Act* (CAA) requirements, including those for PSD, standards of performance for stationary gas turbines (40 CFR 60 Subpart GG), and standards of performance for large municipal waste combustors (40 CFR 60 Subpart Eb).

The Final PSD/Title V Permit requires that the combustion turbines (CTs) use only SYNTHESIS GAS (syngas) or natural gas as fuels, and that the rated heat input capacity of the turbines not exceed 1,765 million British Thermal Units per hour at International Organization for Standardization standard day conditions (197 MW power output capacity for each turbine, not including heat recovery steam generator capacity).

The Final PSD/Title V Permit Application was for a 400-MW facility run on syngas generated from fuel briquettes. The direct generation capacity of the two GE 7FA gas turbines used under No Action Alternative 2 and the Proposed Action without the heat recovery generators is 400 MW. The additional electricity generated by the heat recovery generators increases the total facility output to 580 MW. Because the heat recovery generators have no emissions, their capacity output is not included in the permit analysis. The Final PSD/Title V Permit specifically references two GE 7FA gas turbine units with a direct output capacity of 197 MW each. The fuel briquettes were to be produced from a mixture of coal and municipal solid waste (MSW), or from a mixture of coal and sewage sludge. When MSW is used for briquette production, it is first sorted to remove glass and metal items, and is then shredded. The briquette is comprised of 50 percent coal and 50 percent refined MSW. Thus, the briquettes would be similar to a co-feed of RDF pellets and coal. Amendments to the Final PSD/Title V Permit may be required to account for the change in material handling from fuel briquettes to RDF pellets and coal. It is, however, unlikely that such amendments would result in substantive changes to the emission limits contained in the Final PSD/Title V Permit since the permit application material indicates that emission estimates were based on guarantees of stack gas outlet concentrations and estimated stack gas flow volumes that are unlikely to change. The PSD/Title V Permit was formally issued in early June 2001 and Global Energy, Inc., does not intend to seek a modification to the permit until facility design plans are more complete and all relevant modifications can be addressed at one time.

5.7.2 Air Resource Impacts From No Action Alternative 1

No Action Alternative 1 would leave the project site in its existing condition. No energy production facilities would be constructed at the J.K. Smith Site, and no off-site alternative facilities would be constructed. Consequently, there would be no air quality impacts from No Action Alternative 1.

5.7.3 Air Resource Impacts From No Action Alternative 2

No Action Alternative 2 would result in no DOE funding for the Kentucky Pioneer IGCC Demonstration Project, but KPE would build a natural gas-fueled combined-cycle plant at the site. Construction activities would be similar to those required for the proposed project, and the construction period would be about 6 months. The power island also would require construction of a 27-kilometer (17-mile) 138-kV transmission line connecting the site to the local power grid.

Operational air quality impacts under No Action Alternative 2 would be similar in general magnitude to those discussed for the Proposed Action, since the CTs would be the dominant emission sources in either case. Based on U.S. Environmental Protection Agency (EPA) emission rate data (EPA 2000), using natural gas to fuel the CTs would result in 45 percent lower ROG emissions, 81 percent higher NO_x emissions, 6 percent lower CO emissions, 89 percent lower SO_x emissions, and 40 percent lower PM_{10} emissions than would occur under the Proposed Action. Greenhouse gas emissions would be about 25 percent higher under No Action Alternative 2 than under the Proposed Action, since natural gas has a higher carbon content than syngas. No Action Alternative 2 would not have additional emission sources such as the flare for the gasifier facility, fuel unloading and handling equipment, or sulfur recovery equipment.

The workforce required for facility operation would be somewhat smaller than the work force required for the Proposed Action. The workforce has been estimated at 20 percent of overall project operations workforce, or 24 workers. Resulting traffic volumes would be approximately 20 vehicles at any shift change period. This small increment of additional traffic would not have a significant impact on traffic-related air quality conditions in the area.

5.7.4 Air Resource Impacts From the Proposed Action

Construction of the proposed facility would have vehicle, equipment, and fugitive dust impacts similar to any construction project of comparable size. Because the site was previously graded and had some foundation work performed for the J.K. Smith Power Station, there would be less earthmoving activity than would be required for other sites in similar terrain. Construction-related traffic, construction equipment, and fugitive dust from the construction site would be the major emission sources associated with construction activity.

The Kentucky Pioneer IGCC Demonstration Project facility would have several components that would be sources of air pollutant emissions:

- raw material storage and handling
- emergency flare associated with the gasification plant
- cooling tower facility
- vitrified frit handling facilities
- sulfur recovery and handling facilities
- wastewater treatment facilities
- CTs associated with power generation facilities

The air separation plant would have few if any emissions. The Draft PSD/Title V Permit does not set any emission limits for air separation plant or the wastewater treatment facility. The Draft PSD/Title V

Permit does set emission limits or operational requirements for other facility components. Emission controls incorporated into facility designs include:

- enclosed storage of raw materials
- fabric filters on petroleum coke and limestone storage silos
- covered conveyors for raw material transfers
- drift eliminator on the cooling tower
- steam injection or other combustion controls to reduce nitrogen oxide (NO_x) emissions from gas turbines

The Final PSD/Title V Permit for the proposed project requires KPE to conduct a new analysis of Best Available Control Technology for NO_x emissions after facility startup. That analysis must be provided to the Kentucky Division for Air Quality no later than 24 months after facility startup. The Kentucky Division of Air Quality will then determine whether or not to modify the NO_x emission limits and NO_x control equipment requirements for the facility.

Compliance with emission limits set by the Final PSD/Title V Permit will be verified by a detailed set of monitoring and reporting requirements as outlined in the permit. Continuous emission monitoring equipment is required on the generator system stacks for NO_x, CO, O_2, SO_2, and opacity. Initial stack tests are required for NO_x, CO, SO_2, PM_{10}, volatile organic compounds, beryllium, cadmium, lead, mercury, hydrogen chloride, and dioxins/furans. In addition, annual stack tests are required for PM_{10}, cadmium, lead, mercury, hydrogen chloride, and dioxins/furans. Initial monitoring of H_2S is required at the sulfur recovery facility, and periodic opacity observations are required at various material handling facilities.

Raw materials for the gasification plant include RDF fuel pellets, coal, petroleum coke, and limestone. Raw materials would arrive by rail and be stored in buildings or storage silos. Petroleum coke would be used only for cold startup of the gasifier. Once started, the primary fuel would be RDF pellets and coal. Limestone would be added to the fuel feed to serve as a fluxing agent. All feedstocks to the gasifier plant would be transferred from storage facilities using covered conveyors to minimize particulate matter emissions.

The gasification plant would have four fixed-bed, oxygen-blown slagging gasifiers. The gasifiers use a pressurized high temperature, low oxygen environment to decompose fuel into a mixture of gaseous components and a molten ash slag. The low oxygen conditions result in a syngas fuel that is primarily carbon monoxide (CO) and hydrogen, but contains small amounts of other components. The molten slag would be cooled and solidified into an inert, vitrified frit that can be used as a synthetic aggregate. The gasification plant would have an emergency flare system to avoid venting raw syngas in the event of process interruptions or unplanned shutdowns.

The syngas produced by the gasifiers would be cooled in a heat exchanger facility to produce process steam. The cooling would condense light oils and water from the syngas. The condensation process also would remove particulate matter suspended in the syngas. The light oils would be reinjected into the gasifiers. A cooling tower unit would be associated with the heat exchanger facility.

The cooled syngas would then undergo an acid-gas cleanup to remove sulfur compounds and other trace contaminants. One of several commercially proven solvent absorption processes will be selected for the acid-gas cleanup. All of the clean-up processes can provide 99 percent sulfur removal from the syngas. The amine-type solvents used in the process would be recovered and recycled. A prewash extraction product containing various organic components would be reinjected into the gasifiers. The solvent stream containing the removed sulfur would be sent to a Claus sulfur plant for sulfur recovery. Tail gas from the Claus facility would be recycled to the gas cleanup unit, thus avoiding emissions of oxides of sulfur (SO_x).

An air separation plant at the site would produce oxygen and nitrogen for on-site needs. Some of the oxygen would be used in the gasifiers. Oxygen and nitrogen would be blended into the cleaned syngas to dilute it to its desired heating value. The air separation plant would use cryogenic or pressure swing processes to separate oxygen and nitrogen from atmospheric air. Electrical power for the air separation plant would come from the power generation system. Because the only input to the air separation plant is atmospheric air, the gas flow released back to the atmosphere is not considered an emission source under air quality regulations.

The primary power production facilities at the site would be generators powered by two syngas-fueled gas turbines. Each gas turbine would be coupled to a heat recovery steam generator system for further power generation. The gas turbines can run on natural gas (as under No Action Alternative 2) if the syngas fuel supply is interrupted. Combustion exhaust from each gas turbine would pass to a heat recovery steam generator system to power an additional generator. Exhaust gases from each heat recovery steam generator would be released through an exhaust stack. For emissions analysis purposes, the PSD permit application assumed that all syngas would be used in the gas turbines.

The major stationary sources of emissions at the proposed facility would be the generator systems and cooling tower. Dissolved and suspended solids in the water sprayed through the cooling tower would be a source of inhalable particulate matter (PM_{10}) emissions as mist droplets released from the cooling tower evaporate to dryness. Small quantities of combustion exhaust would result from use or testing of the emergency flare. Fugitive PM_{10} emissions would come from material handling (RDF pellets, coal, petroleum coke, and limestone). A small amount of PM_{10} would be released through roof vents at the gasifier building. Wastewater treatment facilities would release small quantities of volatile organic compounds. Table 5.7-1 summarizes the annual emission estimates for the Kentucky Pioneer IGCC Demonstration Project facility based on the PSD/Title V Permit Application. These emission estimates are also representative of the proposed project's use of RDF and coal to generate the syngas.

Table 5.7-1. Emission Estimates for the Kentucky Pioneer IGCC Demonstration Project Facility

	Annual Emissions, Tons per Year				
Emission Source	**ROG**	**NO_x**	**CO**	**SO_x**	**PM_{10}**
Material Handling in:					
Fuel Storage Building					0.58
Limestone Silo Loading					0.01
Limestone Silo Unloading					0.13
Gasifier Building vents					0.57
Emergency Flare	0.10	0.04	0.26		
Vitrified Frit handling					0.35
Cooling Tower					26.28
Generator System stack 1	34.02	556.61	247.38	247.38	85.04
Generator System stack 2	34.02	556.61	247.38	247.38	85.04
Wastewater Treatment	1.90				
TOTALS	70.04	1,113.26	495.02	494.76	198.00

Source: EIV 2000; KDAQ 2001.
Note: Emission estimates for the generator system units are based on emission limits in the Final PSD/Title V Permit, assuming 100 percent syngas fuel.

The Final PSD/Title V Permit shows that SO_x emission allowances are needed, but indicates that there are no nitrogen oxide requirements for the Phase II Acid Rain Permit. Global Energy, Inc., would obtain the SO_x allowances through standard industry practices, such as purchasing them on the open market.

Although sulfur recovery from the syngas fuel system would remove more than 99 percent of the sulfur content of the coal and RDF pellets, the cleaned syngas fuel would still have a sulfur content much higher than that of natural gas. Sulfur emission from use of syngas fuel in the CTs would be similar to the sulfur emissions that would result if the turbines were run on distillate fuel oil. These emissions, however, would be much lower than those from a comparable coal-fired power plant. Because the proposed project

does not have any sulfur emission allowances under the CAA, KPE must obtain existing sulfur emission allowances from another source before the proposed project is allowed to operate.

The potential for acid deposition impacts has been evaluated by assuming that all of the sulfur compounds emitted by the proposed project would be converted into sulfuric acid and subsequently deposited downwind of the project site. For screening analysis purposes, the following very conservative assumptions were made: that wind direction would blow continuously into a single 45 degree compass sector for the entire years and that all sulfur compound emissions would be converted into sulfuric acid and deposited within 96 kilometers (60 miles) of the project site. Since the annual average wind speed for the Lexington region is 14.6 kilometers per hour (9.1 miles per hour) (NCDC 2001), this represents less than 7 hours of transport time as an annual average. Full transformation and deposition of sulfur emissions normally occurs over a period of days rather than a few hours. A 45 degree compass sector extending 96 kilometers (60 miles) from the project site would encompass about 366,244 hectares (905,000 acres). The resulting sulfur deposition rate would be an average of 1.9 kilograms of sulfuric acid per hectare (1.7 pounds per acre) per year. If this were dissolved in the annual average precipitation (113.16 centimeters [44.55 inches] per year), the resulting rainfall would have a pH increment of 5.47 attributable to the project's sulfur emissions. This is only slightly more acidic than the pH of precipitation through clean air in balance with existing atmospheric carbon dioxide concentrations. Even under conservative assumptions, the proposed project would not have any significant impact on acid deposition patterns in areas downwind from the facility. In actuality, the sulfur emissions from the project would be distributed over a much larger area than this, and consequently the project would have even less of an incremental impact on acid deposition.

Greenhouse gas emissions from the proposed project have not been evaluated in the EIV or PSD Permit Application. The primary greenhouse gas that would be emitted by the proposed project is carbon dioxide (CO_2) along with smaller amounts of hydrocarbons. The use of any fossil fuel (i.e., coal, natural gas, petroleum) or other fuel containing carbon (i.e., RDF) to produce power contributes to greenhouse gases. The EPA emission rate estimates for large gas turbine generators fueled by natural gas indicate an emission rate of 546 grams (1.2 pounds) of CO_2 per kilowatt-hour of production output. Under No Action Alternative 2, CO_2 production from the two 197 MW gas turbines would be a maximum of 1.8 million metric tons (2.1 million tons) per year or 5,160 metric tons (5,690 tons) per day.

Since natural gas is composed primarily of methane, ethane, propane, and butane, it has a higher relative carbon content than syngas which is composed primarily of CO, hydrogen, and CO_2. The syngas would be diluted with nitrogen gas to reduce its heat content to the range appropriate for the gas turbines, thus further reducing the carbon concentration of the fuel gas with respect to natural gas. Therefore, it is unlikely that the carbon content of the syngas burned in the CTs under the Proposed Action would exceed the carbon content of natural gas burned under No Action Alternative 2. As a conservative estimate, the carbon content of syngas is estimated to be about 75 percent of the value for natural gas. Assuming an emission rate of 410 grams (0.9 pounds) of CO_2 per kilowatt-hour of production output, the proposed project would produce a maximum of 1.4 million metric tons (1.6 million tons) per year of CO_2 or 3,870 metric tons (4,270 tons) per day.

The CTs and sulfur handling facilities would be sources of small quantities of various hazardous air pollutants. Estimated annual emissions of hazardous air pollutants based on the use of fuel briquettes in the PSD/Title V Permit Application are identified in Table 5.7-2.

Table 5.7-2. Hazardous Air Pollutant Emissions for the Kentucky Pioneer IGCC Demonstration Project Facility

		Estimated Emissions	
Pollutant	**Emissions Sources**	**Pounds/Hour**	**Tons/Year**
Arsenic	Gas Turbines	0.020	0.088
Benzene	Gas Turbines	0.30	1.30
Beryllium	Gas Turbines	0.0020	0.0088
Cadmium	Gas Turbines	0.02	0.07
Carbon Disulfide	Gas Turbines	0.0002	0.001
Carbonyl Sulfide	Gas Turbines	0.03	0.14
Chromium	Gas Turbines	0.0037	0.016
Cobalt	Gas Turbines	0.04	0.18
Formaldehyde	Gas Turbines	0.52	2.27
Hydrogen Sulfide	Gas Turbines and Sulfur Storage/Loading	0.043	0.19
Lead	Gas Turbines	0.03	0.15
Manganese	Gas Turbines	0.013	0.059
Mercury	Gas Turbines	0.002	0.010
Nickel	Gas Turbines	1.042	4.562
Selenium	Gas Turbines	0.005	0.021
Total HAPS Emissions		2.07	9.07

Source: Radian 1999.

Hazardous air pollutant emissions from syngas generated directly from RDF pellets and coal would be virtually identical to these estimates. Radionuclide emissions from the proposed project have not been evaluated in the EIV or PSD Permit Application. Small quantities of radionuclides which naturally occur in fossil fuels may be emitted. Such emissions are expected to be minor and below regulatory thresholds.

The potential for long-term heavy metal deposition impacts has been evaluated by assuming that all of the metal compounds emitted by the proposed project would be incorporated into PM_{10} emissions and deposited downwind of the project site. For screening analysis purposes, the following conservative assumptions were made: that wind directions would blow continuously into a single 45 degree compass sector for 20 years, and that all metal compound emissions would be deposited within 56 kilometers (35 miles) of the project site. Since the annual average wind speed for the Lexington region is 14.6 kilometers per hour (9.1 miles per hour) (NCDC 2001), this represents less than 4 hours of transport time as an annual average. A 45 degree compass sector extending 56 kilometers (35 miles) from the project site encompasses about 124,645 hectares (308,000 acres). Metal compound emissions from the proposed project (as summarized in Table 5.7-2) are estimated at 4.68 metric tons (5.16 tons) per year (93.6 metric tons [103.2 tons] over 20 years). The resulting heavy metal deposition rate would be an average of 0.0375 kilograms per hectare (0.0335 pounds per acre) per year, or 37.5 grams per hectare (0.54 ounces per acre) per year. Over a total of 20 years, the cumulative deposition of heavy metals would total an average of 0.75 kilograms per hectare (0.67 pounds per acre), or 756.6 grams per hectare (10.7 ounces per acre). That quantity does not indicate any potential for significant impacts from heavy metal deposition downwind of the proposed project.

RDF pellets are generally stable, and undergo little or no decomposition during storage. Consequently, no odor problems are anticipated from the transport, storage, or handling of this fuel. Organic compound emissions from the wastewater treatment facility and hydrogen sulfide (H_2S) emissions from the sulfur handling facilities are too small to cause any off-site odor problems.

In addition to the stationary sources noted above, there would be mobile source emissions from employee traffic, service vehicles, and locomotives bringing raw materials to the site. Rail traffic to and from the site would amount to four trains per week. With a total workforce of 120 required for the Proposed Action to support 24-hour operations, commute traffic volumes would be less than 80 vehicles at any shift change period. Highway and rail traffic volumes to and from the site are clearly too low to cause significant ambient air quality impacts.

Dispersion modeling analyses were performed as part of the PSD Permit Application for the proposed project to evaluate the extent to which stationary sources associated with the proposed project might alter ambient air quality conditions. The dispersion modeling analysis followed standard procedures used for PSD permit applications, and covered areas within about 12 kilometers (7.5 miles) of the site. Modeling results are summarized in Table 5.7-3. As indicated in Table 5.7-3, the highest modeled pollutant concentrations are well below the values for the corresponding NAAQS. The highest modeled pollutant concentrations are also below the thresholds set in the EPA PSD regulations to identify incremental air quality impacts that may require further evaluation.

The dispersion modeling results summarized in Table 5.7-3 have been used to extrapolate maximum annual average downwind concentrations for hazardous air pollutants. Those maximum annual average concentrations allow an approximate estimate of cancer risk for several of the hazardous compounds. Table 5.7-4 summarizes the lifetime exposure cancer risk that would be associated with the location of maximum downwind concentrations. The cancer risk values in Table 5.7-4 assume continuous exposure for 70 years. Exposure for a shorter cumulative period would have proportionately lower cancer risks.

Most of the compounds listed in Table 5.7-4 (all except benzene, carbon disulfide, carbonyl sulfide, formaldehyde, and hydrogen sulfide) would be associated only with PM_{10} emissions. Benzene and carbon disulfide would be present in both gas and aerosol phases. Carbonyl sulfide, formaldehyde, and hydrogen sulfide would be present as gases. Dispersion modeling conducted for the PSD/Title V Permit Application indicates that the location of maximum 24-hour average and maximum annual average PM_{10} concentrations would be within 0.8 kilometers (0.5 miles) of the facility, within the boundaries of the J.K. Smith Site property. PM_{10} concentrations beyond the boundaries of the J.K. Smith Site property would be less than the maximum values. The area of maximum annual average concentration for gaseous emissions would be about 9.1 kilometers (5.7 miles) downwind of the facility.

The modeling analysis prepared for the PSD application also considered potential air quality impacts at Mammoth Cave National Park, about 185 kilometers (115 miles) from the proposed project. That analysis found no significant visibility or ambient air quality impacts to the park (EIV 2000).

As noted in Section 4.7, Air Resources, Clark County is designated as an unclassified area for all criteria pollutants. Because Clark County is in attainment of federal air quality standards for all criteria pollutants and has no maintenance area designations, CAA conformity requirements do not apply to federal agency actions related to the proposed project.

Table 5.7-3. Summary of Dispersion Modeling Results for the Kentucky Pioneer IGCC Demonstration Project Facility

		Maximum Modeled Concentration		PSD Rule Significant Impact Level		National Ambient Air Quality Standard	
Pollutant	**Averaging Time**	**Micrograms/ Cubic Meter**	**Parts Per Million**	**Micrograms/ Cubic Meter**	**Parts Per Million**	**Micrograms/ Cubic Meter**	**Parts Per Million**
Nitrogen Dioxide	Annual Avg	0.73	0.0004	1	0.0005	100	0.053
Sulfur Dioxide	3-hours	11.3	0.0043	25	0.0095	1300	0.5
	24-hours	2.4	0.0009	5	0.0019	365	0.14
	Annual Avg	0.33	0.0001	1	0.0004	80	0.03
Carbon Monoxide	1-hour	30.1	0.026	2000	1.747	40,000	35
	8-hours	7.71	0.007	500	0.437	10,000	9
PM_{10}	24-hours	4.87	na	5	na	150	na
	Annual Avg	0.57	na	1	na	50	na

Note: Except for the 24-hour PM_{10} value, maximum modeled concentration values are the highest values from five years of meteorological data. For PM_{10}, the reported 24-hour value is the maximum sixth-highest value for any of the five meteorological years.

All particulate matter emissions from combustion processes involving gaseous fuels would be in the size range collected by $PM_{2.5}$ samplers. Thus, all particulate matter emissions can be considered to be both PM_{10} and $PM_{2.5}$.

On February 27, 2001, the Supreme Court upheld EPA's authority to issue the $PM_{2.5}$ and 8-hour ozone standards. The Supreme Court decision effectively validated EPA's adoption of the $PM_{2.5}$ standards. A few relatively minor issues regarding the 8-hour ozone standard were returned to the DC Circuit Court of Appeals on remand, and the DC Circuit Court of Appeals had previously remanded a few issues regarding the 8-hour ozone standards to EPA for actions which were not appealed to the Supreme Court.

On November 14, 2001, EPA responded to the remand of the 8-hour ozone standard by re-evaluating the standards and then proposing to retain the same 8-hour ozone standard that had been adopted in 1997. On March 26, 2002, the DC Circuit Court of Appeals accepted EPA's proposed actions and dismissed all remaining challenges to the ozone and particulate matter standards. The 8-hour ozone standard still needs to go through the final rule-making process, but there is very little room for further legal challenges to the standards.

EPA has not yet promulgated any regulations that would implement the $PM_{2.5}$ standards in terms of state implementation plan requirements, PSD requirements, NSR requirements, or Title V requirements. EPA estimates that rulemaking to implement the $PM_{2.5}$ standards will not occur until some time in 2004 or 2005.

Source: EIV 2000.

Table 5.7-4. Lifetime Cancer Risk at Point of Maximum Downwind Exposure

Hazardous Air Pollutant	Averaging Time	Extrapolated Maximum Downwind Concentration		Assumed Lifetime Unit Risk Factor for Cancer	70-Year Exposure Cancer Risk (Chances per Million)
		Micrograms/ Cubic Meters	Parts per Million		
Arsenic	Annual Average	0.00030	na	4.3E-03	1.298
Benzene	Annual Average	0.00088	2.810	5.3E-05	0.047
Beryllium	Annual Average	0.00003	na	2.4E-03	0.072
Cadmium	Annual Average	0.00024	na	1.2E-02	2.882
Carbon Disulfide	Annual Average	0.000001	0.0021	na	na
Carbonyl Sulfide	Annual Average	0.00009	0.233	na	na
Chromium	Annual Average	0.00005	na	1.5E-01	8.233
Cobalt	Annual Average	0.00062	na	na	na
Formaldehyde	Annual Average	0.00154	1.886	1.3E-05	0.020
Hydrogen Sulfide	Annual Average	0.00013	0.342	na	na
Lead	Annual Average	0.00051	na	8.0E-05	0.041
Manganese	Annual Average	0.00020	na	na	na
Mercury	Annual Average	0.00003	na	na	na
Nickel	Annual Average	0.01565	na	2.6E-04	4.069
Selenium	Annual Average	0.00007	na	1.4E-04	0.010
Dioxins/Furans	Annual Average	0.00000088	na	3.8E+01	33.581
CUMULATIVE LIFETIME EXPOSURE RISK					**50.253**

Note:Maximum exposure concentrations scaled from dispersion modeling results for PM_{10} (for solid compounds) or NO_x (for gaseous compounds). Dioxins and furans are formed by high temperature combustion of fuels containing organic compounds, chloride compounds, and fluorine compounds. The synthesis gas will contain the types of compounds that can generate trace quantities of dioxins and furans in a high-temperature combustion process, and the gas turbines (not the gasification units) will provide the high-temperature combustion process in which the dioxins and furans can form. This analysis uses the emission rate limit specified in the facility PSD/Title V permit to estimate annual dioxin/furan emissions and resulting individual lifetime cancer risks. This is a very conservative estimate that overstates the actual impact; however, this is the only estimate available for this analysis.

5.8 Water Resources and Water Quality

This section discusses the potential effects of the construction and operation of the Kentucky Pioneer IGCC Demonstration Project facility on water resources and water quality at the project site and surrounding area.

5.8.1 Methodology

The water resources and water quality analysis considers impacts to the Kentucky River, the waterbody with the most potential for impact as a result of project construction and operation. Potential impacts to water resources and water quality were assessed qualitatively and quantitatively by comparing projected impacts of construction and operation to existing water conditions of the Kentucky River.

5.8.2 Water Resources Impacts from No Action Alternative 1

Under No Action Alternative 1, DOE would not provide partial funding for the design, construction, and operation of the proposed project. Because no new construction would occur, there would be no impacts to water resources.

5.8.3 Water Resources Impacts from No Action Alternative 2

Under this alternative, a natural gas-fired power plant would be constructed that would essentially be identical to the power island constructed under the Proposed Action. Under this alternative, the plant would withdraw an estimated 3.8 million liters per day (MLD) (1 million gallons per day [MGD]) of surface waters. This water would be extracted from the Kentucky River. Since the average daily flow of the Kentucky River in the project vicinity was previously calculated to be 12.9 billion liters per day (3.4 billion gallons per day), and the withdrawals for this project would be 3.8 MLD (1 MGD), this additional withdrawal represents less than 0.03 percent of the average daily flow and should not noticeably impact water availability during average flow conditions. As discussed in Section 4.8, the 7-day flow with a recurrence interval of 10 years is 371.5 MLD (98.2 MGD) (UEC 1980). The daily withdrawals for the project would represent approximately 1 percent of this low flow average.

Although KPE would not be required to obtain its own water withdrawal permit from the State of Kentucky, it is useful to compare the expected withdrawals from this alternative to the KDEP, Division of Water's permit issuance guidelines. When issuing permits for water withdrawal, in order to ensure that sufficient flow is reserved for allocation to future users and to maintain water quality and stream habitat, the Kentucky Department of Environmental Protection (KDEP), Division of Water allocates no more than 10 percent of a stream's lowest average monthly flow to any one user. As discussed above, the daily withdrawals for this alternative would represent approximately 1 percent of the low flow average. Although it appears that the river should have adequate capacity, the ability of the river to support the withdrawal under various flow conditions will be further evaluated by the KDEP, Division of Water. KPE has indicated that it would be willing to work with the KDEP, Division of Water during low flow conditions and would cease plant operations if required. Minimal surface water would be consumed for the facility's construction.

Project operations would generate less than 1.5 MLD (0.4 MGD) of wastewater. Treated wastewater is expected to contain conventional pollutants such as nitrogen, phosphorus, total dissolved solids, and biological and chemical oxygen demand. This wastewater would be discharged into the Kentucky River via EKPC's existing 45.7-centimeter (18-inch) discharge. As discussed in Section 4.8, the Kentucky River currently receives treated wastewater from several permitted sources in the vicinity of the project site and water quality is sufficient to support all state designated uses. During the site-specific permitting process for obtaining a Kentucky Pollutant Discharge Elimination System (KPDES) permit for this project, pollutant loads on the river will be examined and discharge limits will be established that will be protective of water quality. Therefore, no adverse impacts to the Kentucky River are expected from the operation of the facility.

The facility would not use or intentionally discharge into groundwater resources during construction and operation. However, there will be potential groundwater contaminant sources present at the facility during both construction and operation. Oil and diesel fuel would be stored in clearly marked tanks onsite. The tanks would be provided with secondary containment structures. Construction equipment would be maintained regularly, and the source of leaks would be identified and repaired. Any soil contaminated by fuel or oil spills would be removed and disposed at an approved disposal site. Lubricating oils, acids for equipment cleaning, and concrete curing compounds are potentially hazardous wastes that may be associated with construction activities. These would be placed in containers within secondary containment structures onsite, and disposed of at a licensed treatment and/or disposal facility in accordance with local or state regulations and in compliance with the manufacturer's recommendations. Paint containers would be tightly sealed to prevent leaks or spills. Excess paint would be disposed of consistent with the manufacturer's recommendations and according to applicable governmental regulations.

In order to further protect groundwater, preparation and implementation of a groundwater protection plan, in compliance with 401 KAR 5:037, would likely be required. In this plan, technological means for protection of groundwater would be identified, taking into account the nature of the potential pollutants and the hydrogeologic characteristics of the area. These could include, but are not limited to, operational procedures, personnel training, spill response capabilities, best management practices, runoff or infiltration control systems, and siting considerations.

Once the plant is operational, a Spill Prevention, Control, and Countermeasure (SPCC) Plan would be developed and implemented pursuant to 40 CFR 112. The SPCC Plan would be part of the overall groundwater protection plan and would require construction measures (such as dikes or berms around certain storage tanks), inspections, and personnel training to prevent the occurrence of spills which could impact soils and groundwater.

The floodplain is defined as the lowlands adjoining inland and coastal waters and other relatively flat and flood-prone areas including, at a minimum, any area inundated by a 1 percent or greater chance flood in any given year. The base floodplain is defined as the 100-year (1.0 percent) floodplain. The critical action floodplain is defined as the 500-year (0.2 percent) floodplain. The facility is located above both the 100-year and the 500-year floodplains. The water intake is located within the river channel and is not considered to be within the 100-year floodplain. As part of the power island facility construction, this intake structure would be extended within the Kentucky River. To support this extension, minor construction activity would be required alongside the river channel on the river bed. Pursuant to the *Clean Water Act,* permits under Section 401 and Section 404 would be required for this action; however, only minor activity would occur and there would be no impact to the floodplain.

Since there are no identified wetlands in the project area, no impacts to wetlands would be expected.

5.8.4 Water Resources Impacts from the Proposed Action

The Proposed Action would use more water and generate more wastewater than No Action Alternative 2. The water requirements for the power island would be the same as No Action Alternative 2; however, the gasification island would require more water for operations and would generate more wastewater.

The Kentucky Pioneer IGCC Demonstration Project facility would withdraw a total of 15.1 MLD (4 MGD) of surface waters. The water would be used in the following processes: 3.8 MLD (1.0 MGD) for the gasification and process water, 3.0 MLD (0.8 MGD) for turbine condenser makeup, 3.0 MLD (0.8 MGD) for fuel gas moisturization and injection, and 3.8 MLD (1.0 MGD) would be for miscellaneous uses. Project operations would generate 1.5 MLD (0.4 MGD) of process wastewater. The other 13.6 MLD (3.6 MGD) is used in the operation of the gasifier, turbine condenser, and fuel gas saturation process, as well as other miscellaneous uses. This water would be extracted from the Kentucky River. As mentioned above, daily

withdrawals of more than 37,854 liters (10,000 gallons) require a state water withdrawal permit in accordance with 401 KAR 4:010 and 4:200; however, because the daily water requirement for the site will be supplied via a pipeline owned and operated by EKPC, it is likely that EKPC will simply request that their water withdrawal permit be amended to reflect the additional withdrawal of water for the project. Since the average daily flow of the Kentucky River in the project vicinity was previously calculated to be 12.9 billion liters per day (3.4 billion gallons per day), and the withdrawals for this project would be 15.1 MLD (4 MGD), this additional withdrawal represents approximately 0.1 percent of the average daily flow and should not noticeably impact water availability during average flow conditions. As discussed in Section 4.8, the 7-day low flow with a recurrence interval of 10 years is 371.5 MLD (98.2 MGD). The daily withdrawals for the project would represent approximately 4 percent of this low flow average.

Although KPE would not be required to obtain its own water withdrawal permit from the state, it is useful to compare the expected withdrawals from this alternative to the KDEP, Division of Water's permit issuance guidelines. When issuing permits for water withdrawal, in order to ensure that sufficient flow is reserved for allocation to future users and to maintain water quality and stream habitat, the KDEP, Division of Water allocates no more than 10 percent of a stream's lowest average monthly flow to any one user. As discussed above, the daily withdrawals for this alternative would represent approximately 4 percent of the low flow average. Although it appears that the river should have adequate capacity, the ability of the river to support the withdrawal under various flow conditions will be further evaluated by the KDEP, Division of Water. KPE has indicated that they would be willing to work with the KDEP, Division of Water during low flow conditions and would cease plant operations if required. Minimal surface water would be consumed for the facility's construction.

The existing water intake structure would be extended within the Kentucky River. As discussed in Section 5.8.3, this action would not affect the floodplain, nor would any action associated with the Kentucky Pioneer IGCC Demonstration Project. However, pursuant to the *Clear Water Act*, permits under Section 401 and Section 404 would be required for this action because floodplain construction includes the channel as well as the adjacent land.

Project operations would generate 1.5 MLD (0.4 MGD) of wastewater. The composition of this wastewater is expected to be the same as described above for No Action Alternative 2, and the same KPDES permitting process would be followed.

The storage and handling of feed materials including coal and RDF could present potential new groundwater contamination sources that would not exist under No Action Alternative 2. However, these materials will be rail shipped to the site, and unloaded, stored, and conveyed in enclosed structures with concrete floors. These materials will therefore have no potential to contact the ground or be leached and transported by rainfall to the subsurface.

Wastewater generated from the proposed project would be treated and discharged to the Kentucky River in accordance with the KPDES permit, which is protective of water quality. As a result, no adverse impacts to the public or Kentucky River Basin are expected to occur. The Water Resources Branch pays particular attention to the proximity of wastewater discharges to drinking water intakes. New sources of wastewater are prohibited within 8 kilometers (5 miles) of a wastewater treatment plant intake. This 8-kilometer (5-mile) limit was established to provide an additional layer of protection for the water quality found at drinking water intakes over treatment alone and is referred to as Zone 1. Zone 2 extends from 8 to 16 kilometers (5 to 10 miles), while Zone 3 is the area from 16 to 40 kilometers (10 to 25 miles) from a Water Treatment Plant intake. The proposed outfall from the project is located in Zone 3 for the Winchester Water Treatment Plant. Water collected at the treatment plant is tested and treated to meet all federal and state requirements concerning drinking water quality. Therefore, no impacts to drinking water are expected.

5.9 Ecological Resources

This section discusses the potential effects of the construction and operation of the Kentucky Pioneer IGCC Demonstration Project on the ecological resources at the proposed project location and the surrounding area.

5.9.1 Methodology

The ecological impact analysis was accomplished by reviewing site documentation and previously published environmental analysis documentation, conversing and corresponding with EKPC's Manager of Natural Resources and Environmental Communications, and corresponding with the U.S. Fish and Wildlife Service (USFWS).

5.9.2 Ecological Resource Impacts from No Action Alternative 1

Under No Action Alternative 1, there would be no changes in land use at the proposed site. Therefore, there would be no identified adverse impacts to ecological resources from No Action Alternative 1.

5.9.3 Ecological Resource Impacts from No Action Alternative 2

No Action Alternative 2 differs primarily from the Proposed Action in that the gasification island and storage building for a 10-day supply of coal and RDF pellets would not be constructed. Thus, the site-specific ecological impacts of No Action Alternative 2 are similar to the Proposed Action. The proposed transmission line, approximately 27 kilometers (17 miles) in length, would be constructed under both alternatives to support the power island. The ecological consequences of transmission line construction and operation will be addressed in a NEPA document that would be prepared in accordance with the U.S. Department of Agriculture's Rural Utility Service NEPA regulations.

5.9.4 Ecological Resource Impacts from the Proposed Action

Approximately 4.8 hectares (12 acres) of old-field vegetation and habitat would be lost from construction and operation of the Kentucky Pioneer IGCC Demonstration Project with an additional 2.8 hectares (7 acres) lost from the construction of the coal and RDF storage facilities. During site clearing activities highly mobile wildlife species or wildlife species with large home ranges (such as deer and birds) would be able to relocate to adjacent undeveloped areas. However, successful relocation may not occur due to competition for resources to support the increased population and the carrying capacity limitations of areas outside the proposed development. Species relocation may result in additional pressure to lands already at or near carrying capacity. The impacts could include overgrazing (in the case of herbivores), stress, and over-wintering mortality. For less mobile species (reptiles, amphibians, and small mammals), direct mortality could occur during the actual construction event or ultimately result from habitat alteration. Acreage used for the development also would be lost as potential hunting habitat for raptors and other predators. In addition to the areas to be disturbed, there would be a decrease in quality of the habitat immediately adjacent to the proposed development due to increased noise level, traffic, lights, and other human activity, both pre- and post-construction. The adjacent habitat also would experience a loss of quality from the reduction in size, fragmentation of the habitat and restriction on mobility for some species (Kelly and Rotenberry 1993).

Given the height of the gasifier stacks, 65 meters (213 feet), the Federal Aviation Administration will require stack lighting. Published accounts of avian collisions with tall, lit structures date back in North America to at least 1874. At least 350 species of Neotropical migratory songbirds are particularly vulnerable to communication tower collisions during their nighttime spring/summer and fall/winter migrations (Manville 2000; Manville 2001). Collisions are especially pronounced when foggy, misty, low-cloud-ceiling conditions exist. The problem has been brought to the forefront with the proliferation of open structured

communications towers and their associated guy wires that have been conservatively estimated to kill 4 to 5 million birds per year (Manville 2000). Differences do exist between solid towers and communications towers with the solid towers being less of an avian threat. Solid tower lighting is the critical consideration for their operation. Under the *Migratory Bird Treaty Act* of 1918, as amended, the USFWS is responsible for the conservation and management of 836 species of migratory birds. To minimize bird strike mortality, the USFWS recommends voluntary compliance with the *Service Interim Guidelines for Recommendations on Communications Tower Siting, Construction, Operation, and Decommissioning* and, for tower construction and operation, the use of low intensity white strobe lights programmed with the maximum off phase of 3 seconds (Manville 2001). The gasifier stacks lighting system will be designed in consideration of USFWS recommendations.

Section 7 of the *Endangered Species Act* requires all federal agencies to ensure that actions they authorize, fund, or carry out do not jeopardize the continued existence of endangered or threatened species. Agencies must assess potential impacts and determine if proposed projects may affect listed species. An initial comment by the USFWS expressed concern regarding the federally-endangered running buffalo clover (USFWS 2000b). The proposed site location does not contain suitable habitat for running buffalo clover. Original habitat for this species were areas of rich soils in the transition zone between open forest and prairie where some shade and water is available, and most are now discovered in areas receiving at least some disturbance such as grazing and mowing. Based on the habitat requirements for this species, it is not expected to inhabit the project site. This expectation has been confirmed by field surveys performed by EKPC biologists. Therefore, there is no effect to running buffalo clover expected either from the construction or operation of the Kentucky Pioneer IGCC Demonstration Project. No other species of federal or state listing are known to be present at the proposed site location or are expected to be potentially affected by the operation of the Kentucky Pioneer IGCC Demonstration Project.

No riparian habitat would be lost due to operation of the water intake and discharge lines (KPE 2001). Surface water impacts resulting from approximately 15 MLD (4 MGD) of river water withdrawal include reductions in river flow and entrainment of aquatic organisms. Current federal regulation requirements for intake design require intake flow rates to be below that which could cause entrainment of aquatic resources. The plant and the intake have not been designed and will not be until the U.S. Army Corps of Engineers (USACE), Louisville District permit is issued, DOE funding approved, financing is secured, and the plant process design is finalized. However specific intake design criteria stipulated by USACE will be followed. The methods include use of leaky or porous dikes, infiltration beds, wells, and wire screens covering the intake.

Approximately 1.5 MLD (0.4 MGD) may be discharged back into the Kentucky River through the discharge line in place since the 1980s. Use of cooling towers will reduce the amount of rejected heat carried by the thermal plume mitigating the subsequent effect on aquatic organisms. Generally, the cooling towers will be high efficiency and the wastewater stream volume may approach zero, because the gasification technology is a substantial water user and typically reuses water from other various parts of the process and plant (KPE 2001). The Kentucky Natural Resources and Environmental Protection Cabinet has established regulatory limits relative to the Kentucky River that explicitly provide a process to establish thermal impact parameters. Kentucky regulations (401 KAR 5:031) contain specific, seasonal temperature limits upon which permitted effluent limits are based. Effluent temperature would be established and specified to avoid impacting the monthly Kentucky River receiving stream limits. Data regarding the quantity of water and temperature of the thermal plume associated with the cooling towers will not be available until data can be obtained after detailed facility design. However, a reasonable bounding scenario for the thermal plume's potential affects on aquatic biota is established by the thermal plume characteristics extensively modeled for the J.K. Smith Power Station Units 1 & 2 proposed for construction in the 1980s. Modeling data generated indicated that the thermal plume under average and worst-case conditions would be very small, respectively occupying approximately 0.7 and 0.8 percent of the river cross section at the 2.8°C (5.0°F) isotherm. Mixing of the thermal plume occurs rapidly, considering that average and worst-case plumes are within 2.8°C (5.0°F) of ambient temperatures at 3.1 meters (10.3 feet) and 5.4 meters (17.6 feet) from the discharge port,

respectively. Total plume travel time to the 2.8°C (5.0°F) isotherm is 2.6 seconds and 13.5 seconds for average and worst-case scenarios. Any organism entering the plume would be exposed to the high temperature regions of the plume for a maximum of less than 14 seconds (UEC 1980).

Although exposure in the plume from the point of discharge to the lower isotherms is theoretically capable of causing some fish mortality, actual mortalities are highly unlikely. The time required for fish body temperatures to approach equilibrium with the temperature of the surrounding water is measured in minutes, not seconds. Thus, mortality will probably not occur since body temperatures will not be significantly altered during the short period of plume passage. Fish are sometimes attracted to warm water when ambient temperatures are low. This may result in cold shock upon the return of the fish to the colder ambient water. The plume possesses high velocities and is elevated above the river bottom because of the buoyancy of warmer water. The high velocity prevents fish and other marine organisms from occupying the high temperature regions of the plume for significant periods of time. The plume location at the surface of the river removes it from the preferred bottom habitat of many species, further reducing the likelihood of fish attraction to the plume. Use of the bounding analysis indicates that benthic organisms most likely to be affected would be in close proximity to the discharge port. Mortality of benthic organisms may occur along with a potential shift in species populations or lack of recolonization of the affected area.

The small size of the plume, the rapid dilution attained and the higher induced velocities within the plume serve to reduce the chances of organism exposure to the discharge, limit the potential for attraction to the heated water, and restrict the amount of available space in the plume area. The impact of the thermal plume on the aquatic ecology of the Kentucky River would be minimal and limited to a small area. The existing discharge line conforms to KDEP requirements and any new discharge would similarly operate in compliance with KDEP requirements (KPE 2001).

5.10 Noise

5.10.1 Methodology

Because project-specific noise data are not available, noise impacts have been evaluated based on generalized equipment and industrial process noise considerations. General considerations of distance based noise attenuation have been used in evaluating off-site noise impacts. Noise from added train operations has been estimated using a passby event noise simulation model. The closest portion of Kentucky Highway 89 is about 1.6 kilometers (1 mile) from the project site, and the community of Trapp is about 3.2 kilometers (2 miles) from the main facility site.

5.10.2 Noise Impacts from No Action Alternative 1

No Action Alternative 1 would leave the project site in its existing condition. No energy production facilities would be constructed at the site, and no off-site alternative facilities would be constructed. Consequently, there would be no noise impacts from No Action Alternative 1.

5.10.3 Noise Impacts from No Action Alternative 2

No Action Alternative 2 would result in no DOE funding for the Kentucky Pioneer IGCC Demonstration Project, but KPE would build a natural gas-fueled combined-cycle plant at the J.K. Smith Site. Construction activities would be similar to those required for the proposed project, and the construction period would be 6 months.

As discussed in more detail for the Proposed Action, construction noise levels would be about 71 "A Weighted" (dBA) at a distance of 305 meters (1,000 feet) from the site, about 61 dBA at a distance of 762 meters (2,500 feet) from the site, about 50 dBA at a distance of 1.6 kilometers (1 mile) from the site, and about 44 dBA at a distance of 2.4 kilometers (1.5 miles) from the site. Construction activity generally would be limited to daytime hours. Construction noise levels would be similar to or less than background noise levels at locations beyond the EKPC property. As discussed in more detail for the Proposed Action, traffic associated with the construction workforce would increase highway traffic noise levels along nearby portions of Kentucky Highway 89 by about 3 dBA.

No Action Alternative 2 also would require construction of a 138-kV transmission line connecting the site to the local power grid. Construction of the 138-kV transmission line to the Spencer Road Terminal of the local power grid would generate short-term construction activity at off-site locations. Right-of-way clearing, rough grading, and erection of transmission line facilities would create localized noise impacts along the transmission line corridor. Noise levels generated by transmission line construction would be less than the construction noise levels generated at the Kentucky Pioneer IGCC Demonstration Project site.

Operational noise levels under No Action Alternative 2 would be similar to those discussed for the Proposed Action, since the CTs and associated generating equipment would be the dominant noise sources in either case. No Action Alternative 2 would not have additional noise sources such as the gasifier facility, fuel unloading and handling equipment, or sulfur recovery equipment. Generating plant operating noise levels would be about 62 dBA at the perimeter of the power plant site, 56 dBA at the EKPC property boundary, 53 dBA at the closest structure outside the EKPC property, and 44 dBA in the community of Trapp. The noise levels beyond the EKPC property boundary are compatible with rural residential land uses.

No Action Alternative 2 would not require any additional rail traffic for the power plant site. In addition, the workforce required for facility operation would be somewhat smaller than the work-force required for the Proposed Action. The facility would employ 24 people during the operation phase. Resulting traffic volumes would be about 20 vehicles at any shift change period. This small increment of additional traffic would not have a significant impact on highway traffic noise conditions in the area.

5.10.4 Noise Impacts from the Proposed Action

Construction activities on the proposed Kentucky Pioneer IGCC Demonstration Project would last for about 30 months. Construction noise generally would be dominated by noise from heavy equipment and heavy trucks. Power tools and other noise sources would make limited contributions to overall construction noise until construction activity shifts to interior building finishing.

A conservative estimate of construction site noise has been developed by assuming an average of about 20 heavy equipment items of various types operating in the same general area over a 10-hour workday. Hourly average noise levels during the active workday would average 90 to 92 dBA at 30.5 meters (100 feet) from the worksite. Distance attenuation and atmospheric absorption would reduce construction noise levels at greater distances. Estimated noise levels would be about 71 dBA at 305 meters (1,000 feet), 61 dBA at 62 meters (2,500 feet), 50 dBA at 1.6 kilometers (1 mile), and about 44 dBA at 2.4 kilometers (1.5 miles). Actual noise levels probably would be less than these estimates due to terrain and vegetation effects. There are very few residences within 1.6 kilometers (1 mile) of the project site, and nighttime construction activity is not anticipated. Construction noise levels would be similar to or less than background noise levels at locations beyond the EKPC property.

KPE has indicated that the construction workforce will vary in size over the facility construction period, and may be as high as 1,000 for short periods of time. On average, construction activity at the Kentucky Pioneer IGCC Demonstration Project site probably would double current traffic volumes on the adjacent portions of Kentucky Highway 89. Because of the logarithmic nature of decibel units, a doubling of traffic volume would result in a 3 dBA increase in highway traffic noise levels. Additional truck traffic generated by construction activity would produce some additional noise level increases along affected highways.

The major noise sources associated with facility operations are expected to be the gas turbine units and the gasifier units. Other less significant noise sources would include material unloading facilities, conveyor systems, cooling tower operations, rail traffic to and from the facility, and vehicle traffic to and from the facility.

Noise levels inside the turbine buildings would be very high, about 155 dBA (EIV 2000). The building enclosing the turbine units would provide a substantial reduction in noise levels at outside locations. Noise levels inside the gasifier building would be relatively high, about 95 dBA (EIV 2000). The building enclosing the gasifiers would provide a substantial reduction in noise levels at outside locations.

Studies conducted by KPE indicate that operational noise levels are expected to be 62.4 dBA at the perimeter of the project site, 56.5 dBA at the EKPC property boundary, 53.4 dBA at the closest structure outside the EKPC property, and 44.7 dBA in the community of Trapp. The noise levels beyond the EKPC property boundary are compatible with rural residential land uses.

RDF pellets and coal would be brought to the site by rail. The facility would require the equivalent of 25 rail cars per day each of RDF pellets and coal. Actual rail shipments would be done by unit trains, with an average of two RDF trains and two coal trains per week. On average, there would be about one train movement into or out of the site each day, although there might be two train movements on some days.

The increased rail traffic required to bring RDF pellets and coal to the site would have only minor effects on noise levels along the affected rail lines. While individual train passbys may be heard over a distance of about 1.6 kilometers (1 mile), effects on ambient day-night average sound (L_{dn}) levels would be minor. In general, it takes a doubling of noise source activity to cause a 3 decibel (dB) increase in noise levels. One or two additional trains in one day would not be a large increase over existing mainline rail operations, and thus would not have much effect on existing noise levels along the mainline tracks. The

incremental noise impacts of typical unit train operations delivering RDF pellets or coal to the project site are summarized in Table 5.10-1.

Table 5.10-1. Noise from Passby Events 24-Hour L_{dn} (dBA)

Distance from Rail Line (ft)	Maximum Passby Noise	Average Passby Noise	1-Hour Average Noise	One Train Per Day	Two Trains Per Day
100	85.3	80.6	66.3	53.4	56.0
200	82.1	77.3	63.1	57.1	53.3
500	76.8	72.6	58.4	48.6	50.0
1,000	68.3	68.3	54.3	47.4	48.1
2,500	61.0	60.9	47.6	46.6	46.8
5,000	52.5	52.3	42.3	46.4	46.5

Analysis assumes 2 locomotives and 100 railcars, a total train length of 6,130 feet, and a speed of 35 mph. All train operations assumed to be daytime events. Background noise levels assumed to be 40 dBA.

Vehicle traffic to and from the site would be a minor addition to the noise environment of areas along Kentucky Highway 89. The facility is expected to employ a workforce of 120, distributed into multiple work shifts over a 7-day work week. Resulting traffic volumes would be less than 80 vehicles at any shift change period. This small increment of additional traffic would not have a significant impact on highway traffic noise conditions in the area.

5.11 Traffic and Transportation

This section summarizes the potential impacts related to road and railway traffic and transportation associated with the construction and operation of the proposed Kentucky Pioneer IGCC Demonstration Project. The methods of analysis for assessing the impacts are also discussed.

5.11.1 Methodology

Impacts are analyzed in comparison to traffic data for the ROI presented in Section 4.11. As stated in Section 4.11.1, capacity studies have not been conducted for the highways analyzed in this section. Based on capacity studies conducted on similar roads throughout the country, the capacity for all roads in this analysis is assumed to be 1,000 vehicle trips per hour. Recent and estimated road traffic data for routes most likely to be traveled to the project site from the main traffic arteries is presented in Table 4.11.1-1. For the purposes of presenting a worst-case bounding study, it is assumed that all vehicle trips occur during 12 daylight hours, half of the estimated counts are traveling in each direction. Half of the trips taken in each direction occur during one of two 2-hour commuting periods. The commuting periods are established as 7:30 a.m. to 9:30 a.m. for the morning commute, and 4:30 p.m. to 6:30 p.m. for the evening commute. For example, the year 2001 estimated count given for Kentucky Highway 89 between milepost (MP) 15.5 and MP 16.0 in Clark County is 10,600 vehicle trips per 24-hour period. Based on the assumptions made, all of these vehicle trips would occur during 12 hours of daylight and half of them, or 5,300, would be traveling each direction on the road. Half of these 5,300 vehicle trips, or 2,650 trips, would occur during the given commuting time for that direction. Established commuting patterns indicate that the morning commute vehicle trips would be toward the centers of population, such as Winchester, Richmond, and Lexington, while the evening commute vehicle trips would be away from them. During the morning commute on this section of road, 1,325 vehicle trips per hour would be made toward Winchester and during the evening commute, the same number would be made heading away from Winchester. During these periods, the established road capacity would be exceeded and traffic jams would be expected to occur. During the other 10 hours of daylight, the remaining 2,650 vehicle trips would occur in each direction on this section of the highway, resulting in an average of 265 vehicle trips per hour.

The existing data indicate that traffic on each road increases as one travels towards the centers of population. It also indicates that traffic on roads near the project site is relatively light. Based on year 2001 estimated vehicle trips and the methodology established in the previous paragraph, non-commute traffic on local roads in the community of Trapp ranges from 5 to 15 vehicle trips per hour in each direction.

For the purpose of this analysis, other assumptions are also made. To further the presentation of the potential worst-case scenario, it is assumed that all workers would drive themselves to work. A more likely scenario, however, is that some of the cars would have more than one occupant. The range of potential impacts reflects an estimated range of 1.0 to 1.2 occupants per vehicle. The worst-case bounding analysis would be only 1.0 occupants, thus requiring more vehicle trips to transport all of the required workers to the site. The lower number represents the best-case scenario of 1.2 occupants per vehicle. KPE has indicated that 20 to 30 heavy-duty trucks per day will be entering and leaving the site during peak construction periods. Since durations of peak construction have not been indicated and to present a worst-case scenario for traffic impacts to the community and ROI, it is assumed that 30 trucks per day enter and leave the site throughout the construction of the facility. This would equate to an additional 60 vehicle trips per day on local roads or 8 vehicle trips per hour, assuming an 8-hour work day.

KPE has indicated that it requires 2,268 metric tons (2,500 tons) per day each of RDF pellets and coal to operate the proposed gasification facility, as well as approximately 127 metric tons (140 tons) per day of limestone. For delivery purposes, a truck is assumed to haul 18 metric tons (20 tons) of coal per load and a railcar is assumed to haul 91 metric tons (100 tons) of coal per load. The coal has a greater density than the RDF and thus, the RDF requires a larger volume container to transport the equivalent mass of material. Each truck or railcar would have a fixed volume that it would be capable of transporting. The 44-56 mix of

coal and RDF by volume previously established in Section 3.2, Fuel Source, indicates that 1.2 times as many trucks or railcars would be required to ship the 2,268 metric tons (2,500 tons) of RDF as would be required to ship a thermal equivalent amount of coal. Due to the comparatively small amount of limestone required for facility use, it is assumed that it has the same density as coal and would require the same number of trucks or railcars to transport equivalent amounts. This equates to 125 truckloads of coal, 150 truckloads of RDF, and 7 truckloads of limestone per day of plant operation, or a total of 282 truckloads per day delivered to the site. This is equivalent to 564 additional vehicle trips in and out of the site per day of operation. Since the plant would operate 24 hours a day, this averages to 23.5 truck trips in and out of the site per hour. The railcar equivalents to supply the plant would be 25 railcars of coal, 30 railcars of RDF pellets, and 1.4 railcars of limestone per day, or a total of 56.4 railcars per day of operation. Given the existing railroad infrastructure at the site, and that the amount of truck traffic required to supply the plant on a daily basis renders delivery by truck almost infeasible, KPE has indicated that all raw materials would be supplied to the proposed plant by rail. The remaining required raw material, petroleum coke, is only needed for the cold-start of a gasifier, which is a very infrequent event, and thus, this analysis assumes that petroleum coke deliveries are included in the established railcar traffic to the site.

5.11.2 Traffic and Transportation Impacts from No Action Alternative 1

Under No Action Alternative 1, no facility would be constructed or operated at the J.K. Smith Site. Therefore, no additional traffic to the site would be required and no impacts would occur to traffic and transportation in the ROI.

5.11.3 Traffic and Transportation Impacts from No Action Alternative 2

Under No Action Alternative 2, the power island facility is constructed at the J.K. Smith Site. During construction, between 100 and 120 vehicle trips would be made on Kentucky Highway 89 prior to and after each work shift. This number could reach as high as 200 trips during peak construction periods. Since existing traffic is light, these additional trips would have little impact to regional traffic. The only exception would be at the intersection of the site access road and Kentucky Highway 89, which could see some back-up at the beginnings and ends of work shifts. Further discussion is presented in the Proposed Action analysis that follows.

The power island would run on natural gas and no raw material would be supplied by rail on a daily basis, therefore no impacts would occur to railroads in the area. The plant would employ 24 people during the operations phase, which would require an additional 48 vehicle trips per day to and from the site. Existing traffic levels in the area indicate that this small number of additional vehicle trips should result in no significant impacts to traffic in the ROI.

5.11.4 Traffic and Transportation Impacts from the Proposed Action

Under the Proposed Action, the gasification island would be constructed and operated at the existing power island site. Construction of the facility is assumed to take 30 months and employ an average of 600 people, with peak employment rising to 1,000 people. During periods of average construction worker staffing, an additional 1,000 to 1,200 vehicle trips would occur in the ROI, 500 to 600 at the beginning of the shift and 500 to 600 at the end of the shift. This number would increase to as high as 2,000 vehicle trips per day during periods of peak construction, 833 to 1,000 at the beginning of the shift and 833 to 1,000 at the end of the shift. These vehicle trips would all occur within a relatively short timeframe as workers arrive for the beginning of their shift and depart at the end. In addition, 30 heavy-duty trucks would operate in and out of the site throughout the workday, adding approximately 8 vehicle trips per hour worked to local roads.

The site location is inherently beneficial to traffic approaching and leaving during regular work hours as it is not near a population center. The majority of the existing morning and evening traffic heads respectively toward and away from Winchester and Richmond along the routes being analyzed while traffic

generated by the construction of the Proposed Action would be headed toward Trapp in the morning and away from Trapp in the evening. Thus, all traffic generated by the Proposed Action would move in opposite directions of existing heavy flows and would not compound any existing traffic problems during commuting periods. Another reason that traffic generated by workers driving to and from the site should not impact existing traffic flows is that the typical construction shift begins and ends comparatively early in the day, around 7:00 a.m. and 3:00 p.m., respectively. Workers are already onsite and home when the respective commuting periods begin.

Significant traffic impacts would occur to the roads in Trapp, especially to Kentucky Highway 89 at the intersection with the site access road. The lack of traffic control devices could lead to significant traffic congestion at this intersection before and after shifts. The two-lane access road would also be heavily congested prior to and after work shifts, as all vehicles must utilize this road. Though the number of vehicle trips generated by the Proposed Action would not be high enough to exceed hourly capacities on any route to the project site, shorter-term capacities may be exceeded as all workers are traveling to and from the site during the same time period. Kentucky Highway 89 would be especially susceptible to this and it would result in periods of minor congestion along the route. Mitigation measures to alleviate any impacts are suggested in Section 5.18 , Mitigation, of this EIS.

One potential issue of concern, especially as the construction shifts end, is the presence of schoolbuses along Kentucky Highway 89. The Transportation Division of the Clark County School Board indicates that schoolbuses operate along this road between 2:50 and 4:30p.m., which coincides with the end of construction work shifts. The Transportation Division indicates that approximately 30 bus stops lie within a 9.6-kilometer (6.0-mile) stretch of Kentucky Highway 89 north and south of the intersection with the plant access road. The safety of the children should not be an issue since the buses stop at the homes of each of the children and not at centralized locations, thus minimizing the amount of walking along the road. The frequent stops required by the schoolbuses combined with the large number of vehicles leaving the plant site would increase the incidences and duration of congestion along Kentucky Highway 89.

The majority of the truck traffic generated by the construction of the facility would be to supply construction materials and to dispose of construction wastes. Truck trips would occur at the average rate of eight per hour, or one every 7.5 minutes, during the workday. The trucks disposing of construction wastes would travel to and from the nearest landfills accepting construction debris, which are located in Montgomery and Estill Counties. The routes to and from the landfills are lightly traveled, two-lane state highways. New truck traffic on these routes should have little to no impact on existing traffic. Trucks carrying construction supplies would most likely operate on the same routes established in Section 4.11.1. Since trucks would only operate during the workday, they should have little to no impact on existing traffic along these routes. Minor impacts, such as a slowing of average traffic speeds, may result as the trucks move through populated areas toward the construction site.

Large construction materials and supplies, such as the gasifier units and steel, would be delivered by rail to the project site. Rail transportation during construction would typically occur during construction shift hours. Specific impacts to rail traffic cannot be analyzed as existing rail traffic data is unavailable; however, they would most likely be relatively minor as deliveries to the site would be coordinated by CSX Transportation, Inc., the owner of the rail line, to accommodate and facilitate all rail traffic on the line. At the site, the supply trains would travel off of the main rail line and onto the existing rail loop, where they would be unloaded. Since the trains would be completely off of the main line, no delays to mainline rail traffic would be expected during the unloading process. All construction-related traffic and transportation impacts would only occur during the 30-month construction period and would cease once construction was completed and the operation phase of the facility began.

All trucks used for the construction and operation of the facility would haul a maximum of 18 metric tons (20 tons) of weight. Kentucky Highway 89 has a maximum allowable legal gross weight of 36 metric tons (40 tons) for trucks with five or more axles. According to the Kentucky Transportation Cabinet, any

vehicle traveling on Kentucky Highway 89 below the weight indicated should not cause any damage to the roadway.

Operation of the proposed facilities would employ 120 workers. Approximately 200 to 240 vehicle trips would be generated by the operations workers, 100 to 120 at the beginning of shifts and 100 to 120 at the end of shifts. These trips would be spread throughout the day, based on shift start and end times, because facility operation would require staff onsite at all times. The small number of additional vehicle trips required at any given time should not present a significant impact to any of the routes approaching the site location. The lack of traffic control devices may cause minor temporary congestion at the intersection of Kentucky Highway 89 and the site access road as shifts begin and end. Temporary congestion may also be experienced along the site access road as shifts begin and end.

Raw material for the operation of the gasifier units would be supplied to the site by rail. As stated earlier, the facility would require 56.4 rail cars of raw material supplies per day to operate, 30 cars of RDF pellets, 25 cars of coal, and 1.4 cars of limestone. All shipments would be made in covered railcars and the RDF would be further encased in sealed containers. This equates to approximately 4 unit trains of 100 cars each per week to supply raw materials to the site. Eight train movements per week, or about one a day, would be required at the site. Each train movement incorporates either moving a unit train on or off of the main rail line. The addition of one train per day along rail line segment C-273, which is the equivalent of a 7.6 percent increase in traffic, would have little or no effect to traffic along the rail line segment, as deliveries to the site would be coordinated by CSX Transportation, Inc., the owner of the rail line, to accommodate and facilitate all rail traffic. The existing rail infrastructure, including the rail loop and yard capacity, at the project site is sufficient to remove the full unit train from the mainline for unloading of raw materials. All required rail movements onsite would be handled within existing capacity and would not impact the mainline. Therefore, rail traffic generated by the project is expected to have minor impacts to existing rail traffic on the mainline. Noise impacts associated with the additional rail traffic are addressed in Section 5.10.

Any disruption to rail traffic, such as an accident on the line, may require raw materials to be supplied to the facility by truck instead of rail, though this scenario is extremely unlikely to occur. As stated earlier, the equivalent number of trucks required for daily delivery of raw material to the project site is 282. This would equate to 564 truck trips in and out of the site each day, or one truck trip every 2.5 minutes during a 24-hour period, and would result in adverse impacts to local traffic. Truck traffic would significantly impede existing traffic in the area and Kentucky Highway 89 would receive an essentially endless flow of trucks. The 282 trucks required to supply the plant each day would significantly affect other materials transport throughout the ROI as significantly fewer trucks would be available to ship other goods. Measures taken by KPE to avoid relying on trucks to supply raw materials to the site include the construction of materials storage facilities and the large rail yard capacity onsite. Storage facilities would house enough raw materials to supply the facility during any minor interruptions in rail service. The yard capacity at the site is sufficient to handle two unit trains, which could provide extra storage capacity during longer interruptions of rail service.

The facility would generate between 454 and 635 metric tons (500 and 700 tons) of frit per day. Should the frit prove to be marketable, the quantity generated would require the use of train transportation offsite. A maximum of seven railcars per day would be required to transport the frit. Any solid wastes generated during construction and operation would be transported to local landfills in Montgomery and Estill Counties via trucks. This traffic would be minor since it is expected that limited amounts of waste would require disposal.

An Emergency Response Plan and SPCC Plan, which outline and document procedures for providing emergency response and cleanup for any any project-related spills or accidents during materials and waste transport, have not yet been developed by KPE. These plans will be developed during the engineering and construction phases of the project and would adhere to local, state, and federal regulations.

5.12 Occupational and Public Health and Safety

This section presents potential health effects on both workers and the public from the proposed Kentucky Pioneer IGCC Demonstration Project.

5.12.1 Methodology

Occupational and public health and safety issues have been evaluated in the context of general air quality, noise, hazardous materials, and accidents. Air quality, noise, and water quality considerations are addressed in other sections. Analysis of the impacts to occupational and public health and safety consists of an evaluation of the effects caused by the construction and operation of No Action Alternative 2 and the Proposed Action on worker and public health and safety. Health and safety programs would be developed to minimize worker and public health and safety risks during construction and operation of the proposed Kentucky Pioneer IGCC Demonstration Project facility.

5.12.2 Occupational and Public Health and Safety Impacts from No Action Alternative 1

No Action Alternative 1 would leave the project site in its existing condition. No energy production facilities would be constructed at the Kentucky Pioneer IGCC Demonstration Project site. Consequently, there would be no occupational or public health and safety impacts from No Action Alternative 1.

5.12.3 Occupational and Public Health and Safety Impacts from No Action Alternative 2

The level of risk to workers increases in relation to the amount of new construction required. Construction accident risks generally increase based on the length of the construction period. No Action Alternative 2 would involve the construction and operation of a natural gas-fired power plant and a 27-kilometer (17-mile) transmission line. It is anticipated that 120 workers would be employed during the average construction period and 200 during peak construction, with construction lasting approximately 6 months. Typical worker impacts present in the construction industry would be expected from the construction of the proposed Kentucky Pioneer IGCC Demonstration Project facility. During the construction, compliance with Occupational Safety and Health Administration (OSHA) construction safety standards would be the responsibility of the construction contractor selected for the project. Compliance with these standards would provide for basic standards of worker health and safety during construction and operation.

The potential noise impact to workers from heavy equipment operation and activities such as cutting metal or grinding operations could potentially pose higher noise levels to workers than noise during actual plant operations. Construction workers could potentially be exposed to airborne emissions from routine activities such as welding, soldering, grinding, painting, and cleaning operations. These exposures would be intermittent, but may be intense and would be evaluated at the time of construction. Appropriate health and safety measures would be implemented for all identified and anticipated hazards to worker health and safety. Therefore, the potential adverse impacts to worker health and safety during construction would be minimized.

Potential health impacts to the public associated with construction of No Action Alternative 2 or the Proposed Action include fugitive dust typical of construction sites and noise. Since the closest residence is approximately 1 mile away from the proposed site, the public would not be affected by construction-related noise and fugitive dust emissions.

During plant operation, possible worker and public health effects could occur as a result of fire or a natural gas explosion. Fire and explosion hazard issues would be addressed through basic facility design considerations. Therefore, the likelihood of fire or explosion from the installation of new pipelines would be small.

5.12.4 Occupational and Public Health and Safety Impacts from the Proposed Action

Since construction accident risk increases based on the length of the construction period, potential construction risks would be greater under the Proposed Action because several additional facilities (gasification plant, sulfur removal and recovery facility, air separation facility, and RDF pellet and coal storage areas) would be constructed. It is anticipated that 600 workers would be required during the average construction period and 1,000 workers during peak construction with a construction period of approximately 30 months. Other impacts from the construction of the Kentucky Pioneer IGCC Demonstration Project, including the 138-kV transmission line, would be similar to those detailed in the No Action Alternative 2 analysis.

Operation of the proposed facility would require an estimated 120 permanent workers and could increase risks to site workers from industrial-type work hazards and accidents. Impacts associated with operation of the gasification island component of the facility include the accidental or emergency release of raw syngas, acid gases or large quantities of fugitive particulate emissions from raw material (RDF pellet, coal, petroleum coke and limestone) handling. Accidental releases of raw syngas due to process interruptions or unplanned shutdowns would be prevented by the use of the emergency flare system. Unplanned shutdowns or process interruptions are expected to be rare occurrences and thus, the likelihood of raw syngas releases would be very low. Potential releases of fugitive dust emissions during material handling would primarily affect on-site workers but would be minimized or avoided by using covered conveyors and engineering controls. The potential for exposure to dust during maintenance and repair operations would be minimized by strict adherence to health and safety programs such as respiratory protection and confined space entry. This would minimize any potential worker impacts. Although there is some potential for fire or ignitability from coal and RDF storage, appropriate design and engineering controls would address these potential problems and minimize risks to workers.

The noise levels from the gasifier and turbines are expected to be 95 dBA to 155 dBA, respectively, and would pose a noise hazard to workers in those areas. Areas around such equipment would be posted as high noise areas and hearing protection would be required. A hearing conservation program would be developed by KPE. Buildings for the turbines and the gasification unit would be designed to reduce the noise levels outside of those areas. Facility operational noise generally would be less than ambient background noise conditions at locations outside the 1,263-hectare (3,120-acre) J.K. Smith Site. Even during quiet nighttime hours, noise from the proposed facility would be close to ambient noise levels at distances of more than 1.6 kilometers (1 mile). Noise from facility operations should not have a significant impact on ambient noise levels beyond the J.K. Smith Site.

Operation of the rail spur, loading and unloading facilities, and on-site material moving equipment could cause occupational hazards. However, potential risks would be minimized through worker training, routine internal inspections and conduct of safety meetings to reinforce workers' awareness of safety issues pertinent to the plant. The proposed project safety procedures would also include development of a site-specific safety manual.

Hazardous air pollutant emissions from the Proposed Action are discussed in Section 5.7, Air Resources. Dispersion modeling results in Table 5.7-3 show that criteria pollutant emissions from the proposed project would be well below NAAQS and PSD significant impact levels. Therefore, the incremental increase in air emissions from the Proposed Action would be very small and present little risk of adverse noncancer health effects.

Maximum downwind concentrations of hazardous pollutants expected to be emitted from the proposed facility and the associated maximum lifetime cancer risks are shown in Table 5.12-1. With the exception of benzene, carbon disulfide, carbonyl sulfide, formaldehyde, and hydrogen sulfide, all other hazardous pollutants would be associated with PM_{10} emissions. Dispersion modeling conducted for the PSD/Title V Permit Application indicates that the location of maximum 24-hour average and maximum

annual average PM_{10} concentrations would be within 0.8 kilometers (0.5 miles) of the facility, within the boundaries of the J.K. Smith Site property. PM_{10} concentrations (and consequently most hazardous air pollutant concentrations) beyond the boundaries of the J.K. Smith Site property would be less than the maximum values.

The cancer risk values in Table 5.12-1 are the incremental risk added by the Kentucky Pioneer IGCC Demonstration Project. The estimated incremental cancer risk from the Proposed Action is a very conservative estimate based on continuous exposure to hazardous pollutant emissions for 70 years. Most of that risk is attributable to potential dioxin/furan exposure (which may be overestimated by the extrapolation procedures used in the analysis). The cumulative estimated lifetime exposure risk (probability of developing cancer) of 5.0E-05 ($5x10^{-5}$) applies to the location of maximum annual average downwind impacts which is within the boundaries of the J.K. Smith Site. Cumulative estimated lifetime cancer risk for off-site locations would be much less than 5.0E-05 ($5x10^{-5}$) and further decrease with distance from the proposed project area. As shown, minor impacts are expected from the emission of hazardous air pollutants.

Table 5.12-1. Lifetime Cancer Risk at Point of Maximum Downwind Exposure

		Extrapolated Maximum Downwind Concentration			
Hazardous Air Pollutant	**Averaging Time**	**Micrograms/ Cubic Meters**	**Parts per Million**	**Assumed Lifetime Unit Risk Factor for Cancer**	**70-Year Exposure Cancer Risk (Chances per Million)**
Arsenic	Annual	0.00030	na	4.3E-03	1.298
Benzene	Annual	0.00088	2.810	5.3E-05	0.047
Beryllium	Annual	0.00003	na	2.4E-03	0.072
Cadmium	Annual	0.00024	na	1.2E-02	2.882
Carbon Disulfide	Annual	0.000001	0.0021	na	na
Carbonyl Sulfide	Annual	0.00009	0.233	na	na
Chromium	Annual	0.00005	na	1.5E-01	8.233
Cobalt	Annual	0.00062	na	na	na
Formaldehyde	Annual	0.00154	1.886	1.3E-05	0.020
Hydrogen Sulfide	Annual	0.00013	0.342	na	na
Lead	Annual	0.00051	na	8.0E-05	0.041
Manganese	Annual	0.00020	na	na	na
Mercury	Annual	0.00003	na	na	na
Nickel	Annual	0.01565	na	2.6E-04	4.069
Selenium	Annual	0.00007	na	1.4E-04	0.010
Dioxins/Furans	Annual	0.00000088	na	3.8E+01	33.581
CUMULATIVE LIFETIME EXPOSURE RISK					**50.253**

Fire and explosion hazard issues associated with the operation of the Proposed Action would be addressed through basic facility design considerations. Preliminary estimates of on-site hazardous material quantities indicate that quantities would be below the thresholds that would require preparation of a formal risk management plan (EIV 2000). No significant occupational or public health and safety impacts are expected from facility operations.

5.12.5 Electric and Magnetic Fields

Both current and voltage are required to transmit electrical energy over a transmission line. The electric field is a function of voltage carried by conductors and the conductor height aboveground. The magnetic field is a function of the amount of current carried by the line and the height of the conductors. Electric and magnetic field (EMF) effects are typically attenuated with distance from the conductors and vary along a transmission right-of-way. All devices that carry electric current (e.g., televisions, radios, computers)

are sources of EMF. The maximum magnetic fields of a transmission line are comparable with the maximum magnetic fields measured near some common household appliances.

For several years, there has been concern by some members of the scientific community and the public regarding human health effects from electromagnetic fields during the transmission of electrical current from power plants. In June 1999, the National Institute of Environmental Health Sciences released its report *Health Effects from Exposure to Power-line Frequency Electric and Magnetic Fields* (NIEHS 1999) which concluded that "extremely low-frequency electric and magnetic field exposure cannot be recognized as entirely safe because of weak scientific evidence that exposure may pose a leukemia hazard." While there is considerable uncertainty about the EMF/health effects issue, the following facts have been established from the available information:

- Any exposure-related health risk to the exposed individual will likely be small.
- The most biologically significant types of exposures have not been established.
- Most health concerns are about the magnetic field.
- The measures employed for such field reduction can affect line safety, reliability, efficiency and maintainability, depending on the type and extent of such measures.

No federal regulations have been established specifying environmental limits on the strengths of fields from power lines. However, the federal government continues to conduct and encourage research necessary for an appropriate policy on the EMF issue. Until more definitive evidence is available, little can be said with regard to the conclusions of these studies other than effects, if present, are small.

For the new 138-kV line, the electric field strength of approximately 1.5 kV per meter would result at the point of maximum strength within the right-of-way. This would decrease to about 0.04 kV per meter at about 61 meters (200 feet) away. The magnetic field at the same point of maximum impact would be less than 200 milligauss, and decreases to less than 6 milligauss at 61 meters (200 feet) away. For No Action Alternative 2, personnel working within the transmission line right-of-way would be exposed to EMF for short durations. Since EMF attenuate with distance from the conductors, exposures would be less with increased distance from the conductors. Because there is still scientific uncertainty about the long-term effects of EMF, the human health effects of EMF from the proposed facility cannot be fully evaluated at this time.

5.13 Waste Management

This section discusses the potential effects of construction and operation of the Kentucky Pioneer IGCC Demonstration Project facility on waste management.

5.13.1 Methodology

The waste management impact analysis consists of an evaluation of the impacts generated by the construction and operation of No Action Alternative 2 or the Proposed Action. Waste management issues have been evaluated in the context of handling, storage, transportation, and disposal of solid and hazardous waste. Specific details on waste generation (e.g., waste volumes and types) will not be known until the plant is designed and operational. Assumptions have been made on the types of wastes expected to be generated based on wastes typical of other small to medium size power generating facilities.

Potential impacts from No Action Alternative 2 or the Proposed Action are qualitatively assessed. To determine if an action may cause a significant impact, both the context of the alternatives and the intensity of the impact are considered. For actions such as those proposed in this document, the context is the locally affected area and significance depends on the effects in the local area. Impacts would be significant if the Proposed Action would permanently affect waste management in the local area.

5.13.2 Waste Management Impacts from No Action Alternative 1

Under No Action Alternative 1, DOE would not provide partial funding for the design, construction, and operation of the proposed Kentucky Pioneer IGCC Demonstration Project and the proposed project would not be constructed. There would be no waste management impacts from No Action Alternative 1.

5.13.3 Waste Management Impacts from No Action Alternative 2

Under No Action Alternative 2, the power island component and transmission line of the Kentucky Pioneer IGCC Demonstration Project facility would be constructed regardless of whether DOE provides funding.

During construction of the proposed power island component, small quantities of industrial solid wastes and hazardous wastes would be generated. KPE would be responsible for storage and disposal of all generated wastes during construction of the proposed facility in accordance with applicable KDEP and *Resource Conservation and Recovery Act* requirements. The selection of waste disposal facilities has not been made but there are several solid waste disposal facilities in the State of Kentucky. Since the volume of solid waste to be generated during construction would be small, it is not expected to affect the life expectancy of solid waste facilities in the area. No impacts from solid waste would be anticipated.

The storage and use of fuel, lubricants and other fluids could create a potential contamination hazard during construction. Spills or leaks of hazardous fluids could contaminate soil and groundwater. The impact of leaks and spills would be minimized or avoided by restricting the location of refueling activities and by requiring immediate cleanup of spills and leaks of hazardous materials.

Oil and diesel fuel would be stored in clearly marked tanks onsite. The tanks would be provided with secondary containment structures. Construction equipment would be maintained regularly, and the source of leaks identified and repaired. Any soil contaminated by fuel or oil spills would be removed and disposed at an approved disposal site. Lubricating oils, acids for equipment cleaning, and concrete curing compounds are potentially hazardous wastes that may be associated with construction activities. These would be placed in containers within secondary containment structures onsite, and disposed of at a licensed treatment and/or disposal facility in accordance with local or state regulations and in compliance with the manufacturer's recommendations. Paint containers would be tightly sealed to prevent leaks or spills. Excess paint would

be disposed of consistent with the manufacturer's recommendations and according to applicable governmental regulations.

Sanitary wastes generated during operation would be treated in the plant wastewater treatment system. Treated wastewater would be discharged to the Kentucky River in accordance with the site-specific KPDES permit.

All hazardous and toxic waste generated during construction would likely be disposed of at out-of-state hazardous landfills since there are no hazardous waste disposal facilities in the State of Kentucky. Only small amounts of hazardous waste would be generated during construction and no impacts from hazardous or toxic materials are anticipated.

During plant operations, small quantities of industrial solid wastes would be generated. The expected waste streams include office garbage, liquid maintenance wastes, wastewater treatment sludge, and waste oil. Since the power island is still in the early planning phase, anticipated annual volumes of wastes are not yet known. By generating industrial solid waste, the Kentucky Pioneer IGCC Demonstration Project facility is subject to the provisions of 401 KAR 32.010. The facility is required to notify KDEP in writing of its status as a solid waste generator within 30 days after it first generates such wastes. An annual waste generation report is required to be submitted to KDEP pursuant to 401 KAR 32.040. A solid waste permit is not required since the plant would not dispose of solid waste onsite. Since the volume of solid waste expected to be generated during operation would be small, no impacts from solid waste are anticipated.

The quality of both the surface water and the groundwater could be affected in the event of potential spills or leaks from storage containers of fuel, lubricants, fluids, and chemicals. An SPCC Plan would be developed during the detailed design of the proposed facility in accordance with applicable regulations.

The proposed facility is expected to generate small volumes of maintenance-related hazardous wastes. All hazardous wastes would be managed in accordance with state and federal hazardous waste regulations. No hazardous waste would be treated or disposed of onsite, therefore, a state hazardous waste permit would not be required. Since management of hazardous waste would be in accordance with state and federal hazardous waste regulations and small volumes of hazardous waste are expected to be generated during operation of the proposed facility, no impacts from hazardous or toxic materials are anticipated.

5.13.4 Waste Management Impacts from the Proposed Action

The Proposed Action consists of the construction and operation of the gasification island, power island, and transmission line. It is anticipated that the volume of waste generated from construction of the Proposed Action would be greater since there are more facilities associated with this action. Wastes generated during construction and operation of the power island would be similar to those under No Action Alternative 2 and managed accordingly. KPE would be subject to the same regulations as discussed under No Action Alternative 2.

Some solid waste in the form of dust fines could be generated in the storage and handling of coal and RDF. However, the RDF pellets and coal would be shipped to the site in covered or closed containers and unloaded using a covered conveyor system. Dust control measures would be an integral part of the unloading and handling system. Coal and RDF fines would be injected into the gasification process, thereby avoiding separate handling. In addition, unconverted fines and light ash materials from the raw syngas would be removed using wet scrubbers and reinjected into the gasifier. Therefore, this waste stream is expected to be minimal. The wastes associated with the power facility would be the same as those under No Action Alternative 2.

The Kentucky Pioneer IGCC Demonstration Project is inherently a waste minimization facility. The facility would minimize waste by converting inert ash (primarily coal and RDF) from the gasification process into vitrified frit, a glassy silica matrix material, and hydrogen sulfide from the sulfur recovery process to

elemental sulfur. Operation of the gasification component of the Proposed Action would generate vitrified frit from the quenching of molten slag and elemental sulfur. Frit and recovered elemental sulfur are not waste streams; rather, they are considered commercial products. Frit, which consists of all the inorganic materials from the feed, is nonleachable by EPA standards and thus nonhazardous (Schulz 2000; Nagl 2002). Analysis of gasification processes have found that the slag is not a good substrate for binding organic compounds so it is usually found to be nonhazardous, exhibiting none of the characteristics of hazardous waste. Also, because the slag is in a fused, vitrified state, it rarely fails Toxicity Characteristic Leachate Procedure (TCLP) for metals (DOE 2000). KPE expects the frit to not only pass the TCLP criteria but also the more rigorous TCLP Universal Treatment Standard criteria.

The vitrified frit produced by the gasification process would be marketable. However, if some portion of the frit is not readily sold, it would be stored temporarily in covered railcars and/or disposed of at a permitted industrial solid waste disposal facility as necessary. Recovered sulfur from the gasification process would also be sold.

Even though water, injected as steam in the gasification process, would be heavily reused and condensed oils and tar would be refluxed to the gasifier, a small portion of the water used in cooling and cleaning the syngas would be purged from the system to avoid the accumulation of dissolved salts. This process wastewater as well as sanitary wastewater and stormwater would be treated in the plant wastewater treatment system. Treated wastewater would be discharged to the Kentucky River in accordance with the site-specific KPDES permit. Solid waste (sludge) from the wastewater treatment, primarily treated salts, is expected to be nonhazardous. However, operation procedures would ensure that all wastes are appropriately tested and disposed of in an approved landfill. The wastewater treatment process would not include a sedimentation pond.

There would be no waste streams associated with the air separation process of the Proposed Action.

5.14 Cumulative Impacts

5.14.1 Definition of Cumulative Impacts and Methods of Analysis

5.14.1.1 Cumulative Impacts Definition

Evidence is increasing that the most significant environmental effects may not result from the direct effects of a particular action, but from the combination of individually minor effects of multiple actions over time (CEQ 1997). The Council on Environmental Quality (CEQ) regulations implementing the procedural provisions of NEPA define cumulative effects as "the impact on the environment which results from the incremental impact of the action when added to other past, present, and reasonably foreseeable future actions regardless of what agency (federal or non-federal) or person undertakes such actions" (40 CFR 1508.7). The regulations further explain "cumulative effects can result from individually minor but collectively significant actions taking place over a period of time."

5.14.1.2 Method of Analysis

The cumulative impacts analysis qualitatively presented in this document is based on the potential effects of the Kentucky Pioneer IGCC Demonstration Project when added to similar impacts from other projects in the region. An inherent part of the cumulative effects analysis is the uncertainty surrounding actions that have not yet been fully developed. The CEQ regulations provide for the inclusion of uncertainties in the EIS analysis and state that "when an agency is evaluating reasonably foreseeable significant adverse effects on the human environment in an EIS and there is incomplete or unavailable information, the agency shall always make clear that such information is lacking" (40 CFR 1502.22). The CEQ regulations do not state that the analysis cannot be performed if the information is lacking. Consequently, the analysis contained in this section includes what could be reasonably anticipated to occur given the uncertainty created by the lack of detailed investigations to support all cause and effect linkages that may result from the proposed project, and the indirect effects related to construction and long-term operation of the facility.

In the previous resource descriptions and impacts analysis, Chapter 4, Affected Environment, and Chapter 5, Environmental Impacts, the potential environmental effects of No Action Alternative 2 and Proposed Action were evaluated with respect to existing conditions or "background." This takes into account past actions within and in the vicinity of the Kentucky Pioneer IGCC Demonstration Project. Therefore, discussions in this section will center on the potential effects of recently completed and reasonably foreseeable future actions in the ROIs. Because cumulative impacts accrue to resources, it is important that the analysis of impacts focus on specific resources or impact areas as opposed to merely aggregating all of the actions occurring in and around the proposed project and attempting to form some conclusions regarding the effects of the many unrelated actions. Narrowing the scope of the analysis to resources where there is a likelihood of reasonably foreseeable impacts accruing supports the intent of the NEPA process which is "to reduce paperwork and the accumulation of extraneous background data; and to emphasize real environmental issues and alternatives"(40 CFR 1500.2[b]). Each resource analyzed has its own geographic boundary and the timeframe is assumed to equal the 20-year life expectancy of the proposed project.

The following existing and proposed facilities, operations, and activities may add to the potential cumulative impact of the proposed project:

1. EKPC owns and operates three 80 MW gas turbines 0.8 kilometers (0.5 miles) west of the proposed site. Transmission lines are associated with these turbines. A fourth 80 MW unit is currently under construction. Each of these units are peaker units and only operate for limited timeframes during periods of peak electricity demand.

2. EKPC is proposing to install and operate an additional (fifth unit) 80 MW unit near the site of the proposed project. Associated with this unit is a proposed 138-kV electric transmission line. The new transmission line is approximately 19.3 kilometers (12 miles) in length and will require a 30 to 45 meter (100 to 150 foot) wide right-of-way. The proposed route for the electric transmission line extends from EKPC's J.K. Smith Plant in a southwesterly direction paralleling an existing electrical transmission line for approximately 4.8 kilometers (3 miles) when it then turns more southerly to connect to an existing electric substation in Madison County, Kentucky. EKPC has indicated that two more 80 MW units may also be installed at this site in the near future. These facilities would also be peaker units.

3. As discussed in Chapter 3, the low margin of transmission capacity upon completion of the proposed project, as well as the addition of up to four new 80 MW units near the site, would trigger the need for further expansion of the transmission system in the near future. Based on recent system expansions completed in the area, it is expected that EKPC would install additional transmission lines from the J.K. Smith Site to each of the following locations; the Spencer Road Substation in Montgomery County; the Avon Substation in Fayette County; and the Lake Reba Substation in Madison County. EKPC has indicated that a new 345-kV transmission line may be built from the J.K. Smith Site to the Avon Substation soon after the proposed project is completed. Design plans have yet to be developed for any additional transmission lines. Other possible, though less likely, system expansions within the 20-year life span of this project include transmission lines from the J.K. Smith Site to each of the following locations; the Stanton Substation in Powell County, the Maggard Substation in Maggoffin County, and the Brodhead Substation in Rockcastle County.

4. The population projections for the years 2000 through 2010 indicate that in the socioeconomic ROI, comprised of Clark, Fayette, and Madison Counties, population will continue to grow, increasing by approximately 4.4 percent.

5.14.2 Summary of Potential Cumulative Impacts

The following resource analysis indicates that future potential cumulative impacts contributed to by the Kentucky Pioneer IGCC Demonstration Project are additive in some resources areas. The proposed project would contribute to the overall economic and population growth in the area. Projections for the years 2000 through 2010 indicate that in the socioeconomic ROI, comprised of Clark, Fayette, and Madison Counties, population will continue to grow, increasing by approximately 4.4 percent during the period. Therefore, pressure will continue to be exerted on all resource areas. The 20-year operation period for the Kentucky Pioneer IGCC Demonstration Project would require approximately 120 workers who are expected to reside in the ROI. This will provide additional employment opportunities within the local area and would indirectly contribute to the creation of an additional 270 jobs in the ROI.

The ROI for cumulative effects to aesthetic and scenic resources is the viewshed, which is the broad area that would be able to view the Kentucky Pioneer IGCC Demonstration Project facilities and the associated electrical transmission line. The viewshed area is determined largely by topographic and distance constraints. The Kentucky Pioneer IGCC Demonstration Project would have an aesthetic and scenic cumulative impact. The J.K. Smith Site currently contains three 80 MW CTs, with a fourth unit currently under construction, approximately 0.8 kilometers (0.5 miles) west of the proposed project site. Cumulative visual impacts would occur with the addition of the proposed facility and the other reasonably foreseeable projects discussed previously. The site would appear as more of an industrial type setting with the dominant feature being the Kentucky Pioneer IGCC Demonstration Project's gasifier facilities. The construction of three more 80 MW CTs near the three existing CTs and the addition of increased transmission capacity in the form of transmission lines would drastically change the proposed site's appearance. The dominant visual features of the project, the two gasifier facility stacks, would be seen as far away as Winchester, which is 13.4 kilometers (8.3 miles) to the northeast. Other construction in the area of the plant would also present

a cumulative impact to visual resources, though no reasonably foreseeable projects contain a feature as dominant as the gasifier stacks associated with the Proposed Action.

The Kentucky Pioneer IGCC Demonstration Project would permanently remove the approximately 4.8 hectares (12 acres) of land required for the facility from other uses while the facility is in use. The construction of other CTs by EKPC near the site would also require the allocation of land for the structures, removing further tracts from other use. Based on the construction of other CT units at the J.K. Smith Site, each new CT unit foundation would require an area of approximately 6.1 meters (20 feet) by 30.5 meters (100 feet). Transmission lines near the facility have a typical right-of-way of 30.5 to 45.7 meters (100 to 150 feet) and each new transmission line constructed would require a similarly sized right-of-way. The reasonably foreseeable cumulative impacts to land use would be dependent upon the amount of development at the J.K. Smith Site, but the general result would be that more land would be required for facility and electrical generation development. The amount of development at the J.K. Smith Site should not present a concern to other potential uses of the land as the entire 1,263 hectare (3,120 acre) site is privately owned by EKPC. Future cumulative impacts to soils would come from further disturbances due to the construction and operation of the aforementioned reasonably foreseeable facilities; however, this also is not a concern as the entire J.K. Smith Site was disturbed during the initial phases of the discontinued J.K. Smith Power Station development in the early 1980s.

The cumulative land use impacts would also impact ecological resources within the region. The amount of land lost due to development is equivalent to the amount of vegetation and habitat lost to species in the area. All impacts to ecological resources would be additive and would increase with potential future development. Pressures to find new food sources and habitats will increase as species lose more habitat to development in the region. The competition for the remaining habitat would increase as more facilities and transmission lines are constructed throughout the J.K. Smith Site. Thermal plume effects could include mortality of benthic organisms in the local area of the discharge port. Subsequently, a shift in species populations or lack of recolonization of the affected location could result. Should this occur, the result would be cumulative with the impacts generated by other thermal plume discharges within the Kentucky River.

The three CTs currently present within the boundaries of the J.K. Smith Site withdraw water from the Kentucky River at a rate of 1.8 MLD (468,000 gallons per day) during operation. As stated before, these units only operate for brief timeframes during periods of peak system demand, therefore they are not withdrawing water from the Kentucky River on a continual basis. The fourth CT unit, currently under construction, and the proposed fifth CT unit would also operate during peak demand periods and would each withdraw water from the Kentucky River at a rate of approximately 547,000 liters per day (144,000 gallons per day) of full operation. The potential sixth and seventh CTs would most likely have water withdrawal rates similar to those of the fourth and fifth units. The proposed Kentucky Pioneer IGCC Demonstration Project would withdraw 15.2 MLD (4 MGD) from the Kentucky River on a continual basis. The cumulative withdrawal from the Kentucky Pioneer IGCC Demonstration Project facilities and all seven existing and reasonably foreseeable CTs operating at full capacity would be approximately 19.2 MLD (5 MGD) of operation. The average daily flow of the Kentucky River is calculated at 12.9 billion liters per day (3.4 billion gallons per day) near the water intake fixture for all facilities on the J.K. Smith Site. The cumulative withdrawal of all facilities operating full-time at the J.K. Smith Site would be less than 0.15 percent of the average flow of the Kentucky River and would have little impact on water levels within the river itself. No wastewater data is currently available for the existing, proposed, and reasonably foreseeable CT units. Any wastewater generated by these peaker units, however, would be in limited quantities for brief periods of time and would be treated in a similar fashion as wastewater generated by the Kentucky Pioneer IGCC Demonstration Project facility. Cumulative wastewater emissions from the entire J.K. Smith Site would be nearly equivalent to the levels presented in Section 5.8.

The future growth of the region would also contribute cumulative impacts to water resources. The population for the socioeconomic ROI is expected to grow by approximately 4.4 percent, or 15,000 individuals, over the next 10 years. Additional water would be withdrawn from and additional treated wastewater discharged to the Kentucky River to provide resources for the growing population within the

ROI. Though the exact levels of withdrawal and discharge are not presently known, the additional use of water in the Kentucky River would increase the overall cumulative impact to water resources in the project area.

EKPC currently operates three 80 MW CTs at a site adjacent to the Kentucky Pioneer IGCC Demonstration Project site. A fourth CT is under construction at that site, and a proposed fifth CT is in the project approval stage. All CTs operate as peaking units using natural gas as the primary fuel and fuel oil as a backup fuel. At present, the existing CTs operate for about 500 hours per year. Emissions from each CT are estimated to be 5 kilograms (11 pounds) per hour for reactive organic gases (ROG), 54.5 kilograms (120.2 pounds) per hour for NO_x, 27.3 kilograms (60.1 pounds) per hour for CO, 15.47 kilograms (34.1 pounds) per hour for SO_x, and 205 kilograms (5.5 pounds) per hour for PM_{10}. If seven peaking CT units are eventually constructed at the EKPC site and were to operate concurrently, their emissions would be 35 kilograms (77 pounds) per hour for ROG, 381.7 kilograms (841.4 pounds) per hour for NO_x, 198.8 kilograms (420.7 pounds) per hour for CO, 108 kilograms (238.5 pounds) per hour for SO_x, and 13 kilograms (28.5 pounds) per hour for PM_{10}. By comparison, emissions from the proposed Kentucky Pioneer IGCC Demonstration Project are estimated to be 6.6 kilograms (14.6 pounds) per hour for ROG, 111.7 kilograms (246.2 pounds) per hour for NO_x, 81.7 kilograms (180.1 pounds) per hour for CO, 51 kilograms (112.5 pounds) per hour for SO_x, and 22.4 kilograms (49.4 pounds) per hour for PM_{10}.

During hours of concurrent operation for the seven EKPC peaking CT units and the Kentucky Pioneer IGCC Demonstration Project, cumulative power plant emissions from the J.K. Smith Site area would increase by the following percentages compared to emissions from the proposed project alone: 14 percent for ROG, 342 percent for NO_x, 234 percent for CO, 212 percent for SO_x, and 11 percent for PM_{10}. The dispersion modeling analysis for the Kentucky Pioneer IGCC Demonstration Project (Table 5.7-3) showed that maximum downwind pollutant concentrations from the proposed project would be less than 3.25 percent of the relevant state and federal ambient air quality standards. In most cases, the maximum pollutant concentrations are less than 1 percent of the relevant standards. Even year-round continuous operation of the seven EKPC peaking CT units in combination with the proposed project would not increase cumulative maximum modeled pollutant concentrations to increments of more then a few percent of the relevant state and federal ambient air quality standards.

The majority of the workforce for the construction and operation of the Kentucky Pioneer IGCC Demonstration Project is expected to reside within the three-county ROI established in Section 4.3. The construction workforce for all other reasonably foreseeable projects near the project site would also reside within this ROI. The construction and operation of the Kentucky Pioneer IGCC Demonstration Project facility, as well as the construction of the proposed fifth and potential sixth and seventh CT units and all potential transmission lines would increase traffic on the roadways throughout the ROI. The jobs indirectly created by these projects and the growing population in the ROI would lead to more vehicle trips taken per day throughout the ROI. Cumulative impacts to traffic and transportation may occur throughout the ROI in the form of minor increases in traffic congestion, especially during rush-hour time periods.

In response to *Kentucky Executive Order 2001-771: Relating to the Establishment of a Moratorium on Permits for New Power Plants*, the Kentucky Natural Resources and Environmental Protection Cabinet issued *A Cumulative Assessment of the Environmental Impacts Caused by Kentucky Electric Generating Units* on December 17, 2001. The report addresses the potential cumulative impacts of 22 recently permitted plants, including the Kentucky Pioneer IGCC Demonstration Project, in addition to the 34 electric generating units currently in operation in Kentucky. The analysis presented in the report draws similar conclusions to those presented throughout this EIS, though the conclusions are not as exhaustive as those discussed in this document. The report also includes a number of recommendations regarding state environmental regulations that, if implemented, would mitigate many of the cumulative impacts from power plants throughout the state.

The cumulative lifetime cancer risk from the Proposed Action and current and future actions is based on the incremental risks from the Kentucky Pioneer IGCC Demonstration Project and the operation of seven peaking CT units at the J.K. Smith Site. In estimating the cancer risk associated with the seven peaking CT

units at the site, it was assumed that each unit would be operated for a maximum of 2,500 hours per year. For the Proposed Action, most of that risk is attributable to potential dioxin/furan exposure (which may be over estimated by the extrapolation procedures used in the analysis). As a result, these incremental cancer risks are very conservative estimates based on continuous exposure to hazardous pollutant emissions for 70 years at the location of maximum annual average downwind impact, which is within the boundaries of the J.K. Smith Site. Table 5.14-1 contains the annual emissions and lifetime cancer risk for the three operation scenarios. No data were available for estimating dioxin/furan emissions for the peaking units and there is no basis for making either direction emission estimates or extrapolations from the Kentucky Pioneer IGCC Demonstration Project data. The contribution of dioxin/furan emissions would have resulted in an increased lifetime cancer risk from this source. However, the assumptions and the level of conservatism included in the modeling analysis probably account for the lack of data on dioxin/furans. Even at 2,500 hours of operation of the seven CT units, the additional cancer risk contribution would be small. Cumulative estimated lifetime exposure risk for the Proposed Action and current and future actions is approximately the same risk estimated for the Proposed Action (5.0E-05). Cumulative lifetime cancer risk for off-site locations would be much less than (5.0E-05) and further decrease with distance from the proposed project area.

Table 5.14-1. Lifetime Cancer Risk for Maximum Hazardous Air Pollutant Concentrations from EKPC Units

Hazardous Air Pollutant	**Annual Emissions (tons per year)**			**Estimated Maximum Annual Average Concentration (micrograms/cubic meter) if each EKPC Unit is operated for**			**Lifetime Cancer Risk (chances per million) at locations of maximum impact if each EKPC unit is operated for**		
	500 hours per year	*1,500 hours per year*	*2,500 hours per year*	*500 hours per year*	*1,500 hours per year*	*2,500 hours per year*	*500 hours per year*	*1,500 hours per year*	*2,500 hours per year*
Arsenic	0.0014	0.0041	0.0069	4.75E-06	1.43E-05	2.38E-05	0.001167	0.003501	0.005835
Benzene	0.0204	0.0613	0.1022	1.37E-05	4.11E-05	6.85E-05	0.000041	0.00124	0.000207
Beryllium	0.0000	0.0001	0.0002	1.34E-07	4.02E-07	6.70E-07	0.000018	0.000055	0.000092
Cadmium	0.0006	0.0018	0.0030	1.65E-06	4.95E-06	8.25E-06	0.001130	0.003391	0.005652
Chromium	0.0014	0.0041	0.0069	4.67E-06	1.40E-05	2.34E-05	0.040008	0.120025	0.200041
Formaldehyde	0.8366	2.5099	4.1831	5.64E-04	1.69E-03	2.82E-03	0.000419	0.001257	0.002094
Lead	0.0018	0.0053	0.0088	6.88E-06	2.06E-05	3.44E-05	0.000031	0.000094	0.000157
Manganese	0.0991	0.2973	0.4955	3.52E-04	1.06E-03	1.76E-03	NA	NA	NA
Mercury	0.0002	0.0005	0.0008	5.89E-07	1.77E-06	2.95E-06	NA	NA	NA
Nickel	0.0006	0.0017	0.0029	1.98E-06	5.94E-06	9.89E-06	0.000029	0.000088	0.00147
Selenium	0.0031	0.0094	0.0157	1.03E-05	3.09E-05	5.16E-05	0.000082	0.000247	0.000412
MAXIMUM CUMULATIVE INDIVIDUAL LIFETIME CANCER RISK (chances per million):							**0.042927**	**0.128782**	**0.21437**

Note:
[1] Annual emissions for the EKPC units estimated from AP-42, Chapter 3.1 data
[2] Emission estimates assume a mix of 90% natural gas and 10% fuel oil on a heat input basis. Estimated heat input rate of 717 MMBTU/hr per unit, combined heat input rate of 5,017 MMBTU/hr, typical rating per unit of 80 MW.
[3] Maximum downwind annual average pollutant concentrations scaled from the modeling analysis of the Kentucky Pioneer IGCC Demonstration Project facility.
[4] No data available for estimating dioxin/furan emissions for the peaking units and there is no basis for making either direction emission estimates or extrapolations from the Kentucky Pioneer IGCC Demonstration Project data.
[5] Lifetime cancer risk estimates assume 70 years of exposure at the location of maximum downwind concentration.

5.15 Unavoidable Adverse Impacts

This section summarizes potential unavoidable adverse environmental effects associated with the activities analyzed in this EIS. Unavoidable impacts are those that would occur after implementation of all feasible mitigation measures. For this EIS, such impacts were identified for cultural resources, aesthetic and scenic resources, water resources, ecological resources, and traffic and transportation.

5.15.1 Cultural Resources

The Proposed Action involves the construction and operation of the Kentucky Pioneer IGCC Demonstration Project facility, a project that would affect approximately 121-hectares (300-acres) within the J.K. Smith Site. Because of previous cultural resource investigations and site disturbance, impacts to cultural resources appear to be negligible. However, a potential for subsurface discoveries of cultural materials always exists.

Ground disturbance has the potential to affect archaeological, traditional, and paleontological sites located beneath recent sediments. Alteration in the setting of a traditional, archaeological, or historic resource through the introduction of additional noise, pollution, contamination or lighting may adversely affect archaeological, historic, and traditional resources located within the project's Area of Potential Effect.

5.15.2 Aesthetic and Scenic Resources

Construction of the Kentucky Pioneer IGCC Demonstration Project facility would result in ground disturbance and a change in the visual setting at the site. The facility stacks would be visible from the city of Winchester, over 13 kilometers (8.1 miles) from the project site. Soil erosion could occur during the construction of the facility, as well as the release of fugitive dust particles that might temporarily affect visibility in localized areas. However, erosion and dust control measures would be implemented to minimize impacts.

5.15.3 Water Resources

As a result of construction and operation, minor unavoidable adverse impacts would occur because of an increase in water consumption. However, water consumption would be limited by a site-specific permit.

5.15.4 Ecological Resources

The Proposed Action would disturb approximately 121 hectares (300 acres) within the J.K. Smith Site to construct the proposed facility and support infrastructure. The entire project area has been previously disturbed. Because the land and habitat have been previously disturbed within the project boundaries, a negligible impact in biodiversity and wildlife habitat would occur. Construction would have a minor adverse impact on small, less mobile, mammals during project site clearing and mobilization activities. Birds in the project site area would move away from the construction activities to adjacent similar habitat within the J.K. Smith Site or offsite. Impacts from transmission lines on ecological resources will be addressed in a separate NEPA analysis being prepared by the Rural Utility Service. The operation of the proposed facility would increase human presence, night lighting, and noise. Potential exposure to air emissions to plant and animal species within the J.K. Smith Site and in the adjacent surrounding areas may increase due to the operation of the Kentucky Pioneer IGCC Demonstration Project.

5.15.5 Traffic and Transportation

Traffic on area roads around the site would increase as a result of construction and operation due to the additional workers and machinery. Traffic would be heavy at the intersection of Kentucky Highway 89 and the site access road during the construction of the facility. Should raw materials be supplied by trucks, traffic conditions around Trapp would experience adverse impacts due to heavy truck traffic.

5.16 Relationship Between Short-Term Use of the Environment and the Maintenance and Enhancement of Long-Term Productivity

The construction and operation of the proposed Kentucky Pioneer IGCC Demonstration Project would have an impact on the environment for at least as long as the plant is in operation. The land taken for the project would be lost from future development during the period that the land is used as a power plant.

The proposed plant would be consistent with local, state, and federal plans and permits. These plans are based on planning efforts that recognize the need for orderly growth and power service demands within the context of past, present, and future development. The short-term impacts and use of resources for the proposed plant also would be consistent with the maintenance and enhancement of long-term productivity for the State of Kentucky and the EKPC J.K. Smith Site.

5.17 Irreversible and Irretrievable Commitments of Resources

Implementation of the proposed Kentucky Pioneer IGCC Demonstration Project would involve a commitment of natural, physical, human, and fiscal resources. Land used in the construction of the proposed facility would be considered an irreversible commitment during the time period that the land is used as a power plant. However, if greater need arises for the use of the land or if the plant is no longer needed, the land could be converted to another use. At present, there is no reason to believe such a conversion would be necessary or desirable.

As stated in Section 3.1.1, KPE will not begin detailed design of the proposed project, including layout and flowsheet information, until the project financing is finalized. The applicant has, however, provided rough general estimates of quantities of materials required for the construction of the gasification island facilities. The estimates are as follows: steel - 160,000 tons; concrete - 145,000 tons; pipe - 140,000 tons; and wire - 100,000 tons. These materials would be used for plant construction and are generally considered to be irretrievable. Nonrenewable, and therefore irretrievable, natural resources would also be required for construction; however, the quantity of material has yet to be determined. The construction of the facility would require the employment of 600 workers during average periods and as many as 1,000 workers during peak periods. This use of labor is also considered a commitment of irretrievable resources, as these workers would not be able to work in other capacities while employed on the construction site. The only one of these resources considered to be in short supply in the region is labor, given the relatively low unemployment rate of 2.2 percent. As discussed in Section 5.3, this limitation would be overcome by the temporary nature of construction work itself and the addition of new labor to the regional supply, both through individuals becoming an age in which they are eligible for work and an influx of individuals to the ROI. Construction also would require a substantial one-time expenditure of federal funds as part of the Clean Coal Technology Program, which are retrievable by a repayment plan based on future licensing and commercialization of the demonstrated technologies.

Operation of the facility would also require a commitment of irretrievable resources in the form of the gasifier feeds and labor. The gasifier requires feeds of 2,268 metric tons (2,500 tons) per day each of coal and RDF pellets and 127 metric tons (140 tons) per day of limestone, all of which would be irretrievable once the syngas has been created. The waste products from the gasification, including the sulfur, frit, and ash, would be marketable and would introduce a new resource to the region. The labor commitment would be 120 workers for the 20-year operational life expectancy of the facility. Though labor is in limited supply, it is expected that these 120 jobs would be filled by available labor resources within the ROI. The raw materials required to feed the gasification unit are not considered to be in short supply and their use would not have an adverse effect on the operation of the facility.

The commitment of these resources is based on the concept that businesses, residents of the service area, commercial users of power, and the federal government would benefit from the improved quality of service associated with the new plant. These benefits would consist of improved service to meet existing and proposed demands, the results of the demonstration phase for burning coal cleanly, and a greater availability of quality services, which are anticipated to justify the commitment of these resources.

5.18 Mitigation

An overview of planned mitigation measures for the proposed activities outlined in this EIS is presented below. These measures address both direct and indirect impacts to the environment from the construction and operation of the Kentucky Pioneer IGCC Demonstration Project that could remain after application of design features and operating practices required by permits. Mitigation measures for resources not discussed in this section have been determined to be unnecessary.

5.18.1 Cultural Resources

During construction there is the possibility of encountering deeply buried archaeological resources including human remains. To minimize the potential adverse effects to unanticipated discoveries during construction, basic information will be provided to workers involved in ground disturbing activities regarding the recognition of archaeological resources and Native American cultural items and the procedures to be followed upon discovery. The construction contractor will be required to assure that discovery procedures are implemented in all applicable cases. These procedures address the responsibilities under 36 CFR 800.13, 43 CFR 10.4, Section 3(d)(1) of the *Native American Graves Protection and Repatriation Act* (NAGPRA) and the State of Kentucky historic preservation and burial laws. Discovery procedures are summarized below, but should be addressed in detail in the SHPO consultation.

Should human remains be discovered, the local coroner and law enforcement agency must be notified immediately. If the burials are identified as being Native American, NAGPRA regulations may be applicable and DOE should be notified. Immediately after the discovery, construction in the area will cease. An evaluation will be made by a qualified archaeologist regarding the extent of the construction exclusion zone. Construction will not resume in the area until directed by the archaeologist. In compliance with applicable state and federal laws, notification of other agencies, Native American groups and/or the SHPO may be required prior to removal and for a determination of the party that has a legitimate claim to the remains.

In the event that archaeological resources are discovered after the project has begun, a qualified archaeologist will be notified and all construction in the vicinity of the discovery will cease. An evaluation will be made regarding the extent of the construction exclusion zone and construction will not resume in the area until directed by the archaeologist. DOE and the SHPO will be notified. For expediency's sake, the newly discovered property will be considered eligible for the NRHP (as stipulated in 36 CFR 800.13[c]) and a treatment plan will be developed to mitigate any adverse effects. However, if the property is clearly ineligible, and there is agreement with this determination by the representative of DOE and the SHPO, the property will be considered not eligible and would not be subject to further consideration.

5.18.2 Aesthetic and Scenic Resources

Short-term visibility impacts from fugitive dust during construction activities would be minimized using standard dust control measures such as watering.

5.18.3 Geology

Potential soil erosion in the areas of ground disturbance would be mitigated through minimizing areas of surface disturbance and by utilizing construction engineering measures in accordance with permit requirements. Additional mitigation is not anticipated to be necessary.

5.18.4 Air Resources

Emission control requirements (equipment design requirements and operational procedures requirements) for the proposed project will be established by the Kentucky Division for Air Quality and the EPA as part of the PSD Permit Approval process. Emission controls proposed as part of the PSD Permit

Application include enclosed storage of raw materials; fabric filters on limestone storage silos; covered conveyors for raw material transfer; drift eliminators on the cooling tower; and steam injection or other combustion controls on the gas turbines. During construction activities, fugitive dust would be minimized using standard dust control measures such as watering. Covered railcars should also be implemented to minimize fugitive dust from coal and RDF pellet transport to the site.

5.18.5 Water Resources and Water Quality

Potential water resources and water quality impacts would be minimized by pretreatment in a new wastewater treatment facility and by the issuance of permits for compliance with water usage and wastewater discharge. These federal- and state-issued permits would specify site-specific criteria to be met to minimize potential impacts. The facility would be designed to minimize water usage, and any discharges would have to comply with national and state wastewater and stormwater discharge permits. Therefore, no additional mitigation measures are anticipated to be necessary. KPE will cease water withdrawals if drought conditions warrant or if requested by the state.

5.18.6 Ecological Resources

Post-construction mitigation landscaping would consist of a control program for nonnative invasive plant species such as nonnative thistles, fescue, and mustard. The site would be revegetated with a blend of native grasses and forbs. Grasses could include Big Bluestem, Indian Grass, or Switchgrass and forbs such as Blazing Star, Purple Coneflower and Cardinal Flower. Due to the height of the emissions stacks, the Federal Aviation Administration will require stack lighting. To minimize bird strike mortality, the USFWS has developed a set of voluntary recommendations for tower siting, construction, operation, and decommissioning. The gasifier stacks lighting system would be designed in consideration of USFWS recommendations.

5.18.7 Noise

Mitigation measures necessary to minimize noise impacts would be implemented. Buildings housing the gas turbine units should be designed to ensure a substantial reduction in noise transmitted to the outside. A reduction of gas turbine noise to 95 dBA or less, adjacent to the outside of the building, should be considered as a basic design requirement. In addition, the building housing the gasifiers should be designed to ensure a significant reduction in noise transmitted to the outside. A reduction of gasifier noise to 65 dBA or less, adjacent to the outside of the building, would be considered a basic design requirement.

5.18.8 Traffic and Transportation

The majority of the traffic impacts would be experienced during the construction phase with minor impacts experienced during the operation of the Proposed Action. The main traffic concerns requiring mitigation are the intersection of the site access road and Kentucky Highway 89 and the access road itself. The addition of turning lanes and a traffic signal would assist in regulating traffic flows at the intersection. Any changes to Kentucky Highway 89 should be made in conjunction with the 7th District of the Kentucky Transportation Cabinet. To facilitate traffic in and out of the project site, the access road should be widened to four lanes or directional controls should be implemented. Directional controls refer to having both lanes travel in the same direction during peak usage of the road. Appropriate warning signs should be put in place if this method is adopted. Aside from scheduling rail deliveries in coordination with other main rail line traffic, no mitigation is required for rail transportation.

5.19 Environmental Justice

Pursuant to Executive Order 12898, *Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations* (59 FR 32), this section identifies and addresses any disproportionately high and adverse human health or environmental effects on minority or low-income populations from activities described in previous sections of the EIS.

5.19.1 Methodology

Environmental justice guidance developed by the CEQ defines "minority" as individuals who are members of the following population groups: American Indian or Alaskan Native, Asian or Pacific Islander, Black, or Hispanic (CEQ 1997). Minority populations are identified when either the minority population of the affected area exceeds 50 percent or the percentage of minority population in the affected area is meaningfully greater than the minority population percentage in the general population in the surrounding area or other appropriate unit of geographical analysis. Low-income populations are identified using statistical poverty thresholds from the Bureau of Census. The current threshold was defined in 2000 as 1999 income less than $17,463 for a family of four. The threshold applicable for this analysis was defined in 1990 as 1989 income less than $12,674 for a family of four.

Environmental justice impacts become issues of concern if the proposed activities result in disproportionately high and adverse human health and environmental effects to minority or low-income populations. All resource areas analyzed in this EIS have been included in the environmental justice analysis. While impacts from the majority of the resource areas can be measured by proximity to the project, special attention must be given to the effects on human health in local communities. Disproportionately high and adverse human health effects are identified by assessing these three factors to the extent practicable:

- Whether the health effects, which may be measured in risks or rates, are significant (as defined by NEPA) or above generally accepted norms. Adverse health effects may include bodily impairment, infirmity, illness, or death.

- Whether the risk or rate of exposure to a minority or low-income population to an environmental hazard is significant (as defined by NEPA) and appreciably exceeds or is likely to appreciably exceed the risk or rate to the general population or other appropriate comparison group.

- Whether health effects occur in a minority or low-income population affected by cumulative or multiple adverse exposures from environmental hazards.

The environmental impacts from any project are highly concentrated at the actual project site and tend to decrease as distance from the project site is increased. Due to this relationship, the environmental justice analysis examines smaller geographic regions around the project site for which statistical data is available. The area analyzed for environmental justice (except for economic environmental justice impacts) has no relation to, nor should be in any way mistaken for the three-county ROI established for the socioeconomic analysis. By nature the economic impacts associated with a project occur over a wider area. See Section 4.3, Socioeconomics, for further discussion.

Data for all statistical categories required for the environmental justice analysis has not been made available from the 2000 Census, therefore, this assessment utilizes counts from the 1990 Census. The 1990 Census data reflects social and economic conditions from 1989, the last full year before the census was taken. Clark County, Kentucky, the location of the proposed facility, was divided into six census tracts during the collection of data in 1990. The proposed facility would be located near the center of Census Tract 0204, in the southeastern corner of the county (Figure 5.19-1). Census Tract 0204, which covers 218.3 square kilometers (84.3 square miles), is the smallest geographic region for which demographic data is available. Though the environmental impacts associated with the alternatives analyzed in this EIS would be spread over

larger geographic areas, they would be concentrated in Census Tract 0204. Table 5.19-1 shows the minority and low-income populations for Census Tract 0204 and also presents the data for consecutively larger geographic areas, Clark County, the ROI, and Kentucky, as a comparison.

Table 5.19-1. Comparison of Minority and Low-Income Populations for Geographic Areas Associated with the Proposed Facility

	Census Tract 0204	Clark County	Socioeconomic ROI	Kentucky
White	100.0%	94.0%	87.2%	92.0%
Black	0.0%	5.5%	11.1%	7.1%
American Indian, Eskimo, or Aleut	0.0%	0.3%	0.2%	0.2%
Asian or Pacific Islander	0.0%	0.1%	1.3%	0.5%
Other Race	0.0%	0.1%	0.3%	0.0%
Hispanic	0.0%	0.3%	0.9%	0.6%
Low-Income	19.3%	17.7%	15.9%	19.0%

Note: Persons of Hispanic Ethnicity may be of any race.
Source: Census 1990, Census 1995.

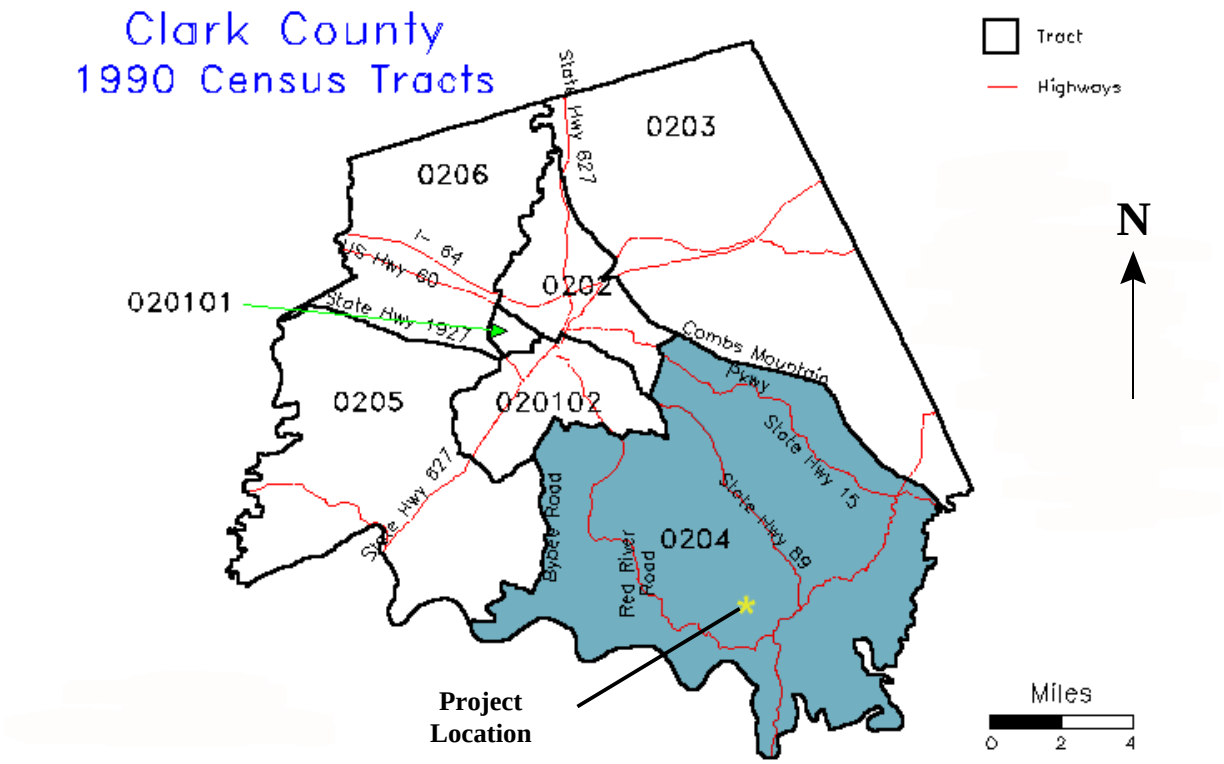
Compared to established national averages, Kentucky has a low minority population throughout the state. Though the Socioeconomic ROI has higher minority populations than the rest of the state, the majority of the minority populations are in Fayette and Madison Counties. Clark County has comparatively fewer minority residents than the rest of Kentucky. The 1990 Census counts for Census Tract 0204, which is the area surrounding the project site, indicates that no members of minority populations live near the project site. The 1990 Census count for Census Tract 0204 shows that all 2,770 residents indicated their race as white (Census 1990). Based on historic population trends in the region, it is expected that the little, if any, change has occurred to the racial composition of Census Tract 0204 in the past decade. Since it is likely that no members of minority populations are present within Census Tract 0204, no environmental impacts would disproportionately affect any minority residents, and no environmental justice issues would occur with respect to members of minority populations.

The national percentage of people considered low-income, which is below the established poverty level, in 1989 was 12.8 percent (Census 2000b). Comparatively, the percentage of Kentuckians considered low-income in 1989 was much higher, at 19.0 percent. The ROI and Clark County had lower rates of low-income individuals than the state; however, they were still significantly higher than the national average. The table indicates that Census Tract 0204, with a rate of 19.3 percent, contains a disproportionately high population of low-income individuals.

By 1995, the national percentage of individuals below the poverty line had increased to 13.8 percent (Census 2000b) while the percentage for Clark County had decreased to 15.3 percent (KDPH 2000). This indicates that the percentage of low-income population in Clark County, though still higher than the national average, is becoming more in line with other areas of the country. This trend can be applied to the census tracts comprising Clark County. Though data is not available for Census Tract 0204 for 1995, a low-income percentage of 16.8 percent can be inferred based on the available county data (KDPH 2000; Tracts 1990).

5.19.2 Environmental Justice Impacts from No Action Alternative 1

Under No Action Alternative 1, DOE would not provide cost-shared funding for the proposed project and no new facilities would be constructed at the proposed project site. Therefore, no disproportionately high or adverse human health effects would be generated and, thus, no environmental justice issues would result.



Source: Louisville 2001.

Figure 5.19-1. Clark County Census Tracts, 1990

5.19.3 Environmental Justice Impacts from No Action Alternative 2

Under No Action Alternative 2, DOE would not provide cost-shared funding for the proposed project; however, KPE, would construct and operate the power island and all associated facilities with a natural gas feed. As shown in the respective resource analyses contained in this chapter, including Occupational Health and Public Safety, no high or adverse human health or environmental impacts would be experienced at or outside the project site under this alternative. Therefore, no environmental justice concerns are raised by this alternative.

5.19.4 Environmental Justice Impacts from the Proposed Action

Under the Proposed Action, DOE would provide cost-shared funding for the design, construction, and operation of the Kentucky Pioneer IGCC Demonstration Project and all associated facilities. As shown in the respective resource analyses contained in this chapter, including Occupational Health and Public Safety, no high or adverse human health or environmental impacts would be experienced at or outside the project site under this alternative. Therefore, no environmental justice concerns are raised by this alternative.